DOCUMENT RESUME

ED 349 380 CE 061 028

AUTHOR	Hamlin, Larry
TITLE	General Mechanical Repair. Minor Automotive Maintenance, Small Engine [Repair, and] Welding: Competency Test Package.
INSTITUTION	East Texas State Univ., Commerce. Educational Development and Training Center.
SPONS AGENCY	Texas Education Agency, Austin.
PUB DATE	91
NOTE	113p.; For related documents, see CE 061 027-029.
AVAILABLE FROM	Educational Development and Training Center, East Texas State University, Commerce, TX 75429 (order no. TI-125-CTP).
PUB TYPE	Tests/Evaluation Instruments (160)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	*Auto Mechanics; Basic Skills; *Competency Based Education; High Schools; Job Skills; Machine Repairers; *Minimum Competency Testing; Occupational Safety and Health; Repair; *Small Engine Mechanics; Trade and Industrial Education; *Welding
IDENTIFIERS	Texas

ABSTRACT

This document contains the competency test package for three sections of a general mechanical repair course: minor automotive maintenance, small engine mechanics, and welding. Following a list of the common essential elements for trade and industrial education, competency tests for the three sections are provided. Each test includes unit name, unit objective, directions, and test questions. Section 1 contains 13 units: automotive shop safety; engine principles; fuel system operation and repair; electrical system; ignition system; lubrication systems; engine cooling system; exhaust system; wheels and tires; brake and bearing systems; frame, suspension, and steering; drive line; and cleaning the car. For section 2 six units are provided: engine principles; principles of carburetion; lubrication systems; starter systems; measurement and instruments; and troubleshooting. Section 3 is composed of six units: introduction to welding; oxyacetylene welding positions and applications; using the cutting torch; introduction to shielded metal arc welding; welding joints and positions; and metallic inert-gas welding. Tests contains essay, multiple choice, fill-in-the-blanks, true or false, and matching questions. (NLA)

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Competency Test Packet

General Mechanical Repair

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Minor Automotive Maintenance
Small Engine
Welding

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GENERAL MECHANICAL REPAIR

COMPETENCY TEST PACKAGE

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Published by
Educational Development and Training Center
East Texas State University
Commerce, Texas

in cooperation with
Texas Education Agency
Vocational Education Programs
Austin, Texas

TI-125-CTP

FIRST EDITION
1991

First printing 1991 — 200 copies

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ACKNOWLEDGEMENTS

Appreciation is extended to the many individuals who contributed their time and talents to the development of General Mechanical Repair.

The following project advisory committee members were instrumental in providing a basis from which to begin these materials:

Mr. Jack Herr, Triple A Parts, Houston, Texas
Mr. Robert Robertson, Sea Brook Lawnmower Service, Houston, Texas
Mr. Manuel Contreras, Auto Zone Parts, Houston, Texas

In addition to the project advisory committee, the following teachers provided excellent assistance in field reviewing materials:

Dr. Phillip McEndree, Corpus Christi State University, Corpus Christi, Texas
Mr. John Pepperday, Clear Lake High School, Houston, Texas
Mr. Davis Ellis, Lake View High School, San Angelo, Texas
Mr. Charles Seabourne, Mabank High School, Mabank, Texas
Mr. John Brock, Dickenson ISD, Dickenson, Texas
Mr. Ronald Green, Marshall High School, Marshall, Texas

The Educational Development and Training Center deeply appreciates the cooperation of the following organizations in providing excellent resource materials to assist with this publication:

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Oxyacetylene Cutting and Welding, and *Shielded Metal Arc Welding*, by Clarence Fortney, Mike Gregory, Mid-America Vocational Curriculum Consortium, Inc. © 1984
Shop Measurement, Jerry Hamlin
Briggs & Stratton, Service and Repair Instructions, by Briggs & Stratton Corporation
Chilton Repair Manual

Gratitude is expressed to the following members of the Educational Development & Training Center Staff for their assistance in the preparation of this publication:

Patricia Johnson, Word Processing
Ludonna Jackson, Editing
Shakuntla Singh and Carol Myers, Proofreaders
Bob Norsworthy, Graphic Arts
Lyndal Burnett, ETSU Instructional Printing Facility, and print shop staff for the quality of this publication.

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PREFACE

The Educational Development and Training Center at East Texas State University is striving to provide needed materials to vocational instructors within the state.

The purpose of this publication is to assist instructors in improving instruction. As these materials are used, it is hoped that student performance will improve and students will be better prepared to assume a role in the field of General Mechanical Repair.

Instructional materials in this publication are written in terms of student performance, using measurable objectives. This approach augments the teaching-learning process. Criterion-referenced evaluation instructions are provided for uniform measurement of student progress. In addition to evaluating recall information, teachers are encouraged to evaluate the other areas, including progress and the finished product.

The instructor should, where appropriate, reinforce the application of basic academic skills. For example, when addressing the area of study, the instructor should stress to students that they will be applying specific mathematical skills such as addition, subtraction, multiplication, and division that they have learned in previous academic courses. Effective teaching practices research, and consequently the Texas Teacher's Appraisal System, emphasizes the relationship of new learning to prior or future learning. In some cases, specific academic skills needed to complete job tasks may not have yet been addressed in the academic courses in which the students have been enrolled. If this is the case, the vocational instructor should introduce and explain the academic skills, and collaboratively work with the appropriate academic teachers. Students should then achieve a level of mastery that will allow them to perform the job tasks. Instructors of vocational courses are encouraged to work closely with instructors of academic courses to ensure that students are taught fundamental academic principles correctly.

Every effort has been made to make this publication basic, readable, and by all means, usable. Three vital areas of instruction (motivation, personalization, and localization) are not included in this publication; however, they should be capitalized on by the instructor. Only then will this publication really become a vital part of the teaching-learning process.

COMMON ESSENTIAL ELEMENTS

75.88 Trade and Industrial Education

(a) The elements in this subsection are common to all trade and industrial courses unless otherwise indicated and shall be included in each course at the appropriate level. They are described here to preclude repetitions in each course. Every school offering trade and industrial education shall provide courses which include the following essential elements:

(1) Leadership concepts and skills. The student shall be provided opportunities to:

(A) demonstrate skills, characteristics, and responsibilities of leaders and effective group members;

(B) demonstrate a knowledge of parliamentary procedure principles;

(C) plan and conduct leadership activities; and

(D) prepare for effective citizenship and for participation in our democratic society.

(2) Concepts and skills related to successful employment and/or postsecondary training. The student shall be provided opportunities to:

(A) identify employment opportunities and preparation requirements in chosen fields;

(B) identify effective methods to secure and terminate employment;

(C) demonstrate effective communication skills both oral and written and follow through on assigned tasks;

(D) demonstrate dependability and punctuality;

(E) demonstrate productive work habits and attitudes;

(F) understand the importance of taking pride in the quality of work performed;

(G) recognize the dignity in work;

(H) develop skills in planning and organizing work;

(I) apply required methods and sequences when performing tasks;

(J) apply principles of time management and work simplification when performing assigned tasks;

(K) identify ethical practices and responsibilities; and

(L) understand the importance of the application of organizational policies and procedures.

(3) Concepts and skills associated with entrepreneurship. The student shall be provided opportunities to:

(A) identify opportunities for business ownership;

(B) understand the risk and profit motive factor;

(C) understand the elements and advantages of the free enterprise system; and

(D) explain the role of small business in the free enterprise system.

(4) Concepts and skills related to safety and safe working conditions. The student shall be provided opportunities to identify and apply safe working practices to all training situations.

(5) Concepts and skills associated with human relations and personality development. The student shall be provided opportunities to:

(A) understand the importance of maintaining good health and proper appearance for effective job performance;

(B) understand oneself and others;

(C) exercise self-control;

(D) accept and use criticism;

(E) recognize basic human relationships as they relate to business success; and

(F) demonstrate characteristics for successful working relationships.

(6) Concepts and skills related to personal and business management. The student shall be provided opportunities to:

(A) explain how management assists in reaching personal and family goals;

(B) explain the management process;

(C) describe the role of management in controlling stress;

(D) identify and understand personal checking accounts;

(E) identify and understand personal loan application processes;

(F) identify and understand different financial institutions;

(G) identify the role and function of business management:

(H) understand the lines of authority; and

(I) identify effective supervisory techniques.

(7) Concepts and skills associated with the specific occupation being taught. The student shall be provided opportunities to:

(A) understand the basic concepts of and develop proficiency in the occupational area for which instruction/training is provided;

(B) develop a fundamental understanding of mathematical principles and scientific procedures;

(C) understand terminology utilized;

(D) identify tools, equipment, and materials used; and

(E) develop and demonstrate appropriate techniques for the selection, use, maintenance, and storage of tools, equipment, and materials.

(ddd) Coordinated vocational-academic education (CVAE)—general mechanical repair (2-3 units) shall include the essential trade and industrial education elements and the following essential elements:

(1) Concepts and skills associated with automobile mechanics. The student shall be provided opportunities to:

(A) understand the functions of the major automobile components;

(B) perform basic preventive maintenance functions on the automobile;

(C) demonstrate proper techniques in performing a tune-up on an automobile; and

(D) remove, repair, and replace automobile brake system components.

(2) Concepts and skills associated with small engine repair. The student shall be provided opportunities to:

(A) understand the functions of the small gasoline engine and its components;

(B) identify types of small gasoline engines;

(C) understand the proper fuel and fuel mixtures required for various types of small engines;

(D) service and repair small engine fuel systems, lubrication systems, and starting systems; and

(E) troubleshoot and repair small engines.

(3) Concepts and skills associated with welding. The student shall be provided opportunities to:

(A) understand the basic theory of oxyfuel welding, brazing, and cutting;

(B) utilize the oxyfuel cutting process to produce freehand cuts;

(C) weld and braze metal plate using the oxyfuel process;

(D) understand the basic theory of shielded metal arc welding; and

(E) utilize the shielded metal arc process to weld butt and tee joints on metal plate.

COMPETENCY TEST

MINOR AUTOMOTIVE MAINTENANCE

NAME _____ **DATE** _____

UNIT: Automotive Shop Safety

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to identify safety and point out unsafe practices in the automotive shop.

DIRECTIONS: Read and answer the following questions in the space provided.

1. Define safety and list the general areas it involves.

2. Select the proper safety attitudes for an automotive shop by circling the letter in front of each.
   a. Take your safety attitudes with you to every automotive shop.
   b. Do not be thoughtless because this causes most accidents.
   c. Guard against accidents when you are the only one working.
   d. Visit others in the shop while working because two people can be more alert to accidents.

3. Determine the ways personal safety affects the individual by underlining the correct answer in each statement.
   a. Personal safety involves protecting (machinery, yourself) from injury caused by your own or others' actions.
   b. Personal safety involves being aware of (unsafe, safe) conditions and practices.
   c. Personal safety involves (protecting, staying away from) others by practicing safety.

4. List four ways group safety can be made effective.

   a.

   b.

   c.

   d.

5. Decide which clothing rules are correct for the automotive shop by answering **true** or **false** to each of the following:

   _____a. The same clothing can be worn in all shop situations.

   _____b. Because there are very few fires in the automotive shop, clothing need not be fireproof.

   _____c. Clothing cannot be kept clean in the automotive shop because the shop is too greasy.

   _____d. Wearing safety glasses does not apply to automotive shops.

6. Determine the correct safety rules for hand tools by answering **true** or **false** for each of the following:

   _____a. Hand tools are small, easily concealed, and never dangerous.

   _____b. Proper use and care can make your job easier as well as safer.

   _____c. Tools should be thrown or tossed to the tool clerk to speed clean-up.

   _____d. Pull on wrenches, but never push.

   _____e. When leaving tools on the floor, put them in neat piles.

   _____f. Carry tools with points up so you will not punch holes in your clothes or legs.

   _____g. Repair loose handles at the end of the day so time will not be wasted during work.

   _____h. Use hammers and other striking tools carefully.

   _____i. Wrenches should fit loosely so they may be quickly removed.

7. Identify the correct safety rules involving the use of power tools by answering **yes** or **no** to each of the following:

   _____a. Always wear eye protection.

_____b. Wear proper clothing.

_____c. Don't tighten abrasive stones because they will crack.

_____d. Power tools should not reach full RPM because they will burn up.

_____e. Keep the grinding tool rest as close as possible to the grinding wheel.

_____f. Stand directly in front of the grinder when grinding.

_____g. Be aware of others around you.

_____h. Wipe up spills promptly.

_____i. Make adjustments on tools before unplugging the cord.

_____j. Never use power tools while wearing wet shoes or standing in water.

_____k. Leave stock loose when drilling.

_____l. Alert others when hot materials are lying around.

8. Point out the correct use of jack stands by circling the correct answer for each of the following.

   a. Use (a jack only, a jack and jack stands) when working on an automobile.

   b. Place stands (in a secure position, anywhere convenient) under the automobile.

   c. Use (gloves, adequate lighting) when placing stands under automobile.

   d. Release the jack (slowly, quickly), allowing the automobile to rest easily on the stands.

COMPETENCY TEST

MINOR AUTOMOTIVE MAINTENANCE

NAME _____ DATE _____

UNIT: Engine Principles

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to define the major engine parts and discuss their relationship to one another.

DIRECTIONS: Read and answer the following questions in the space provided.

1. Explain the purpose of the combustion engine.

2. Point out the differences in the internal and external combustion engines.
   a. Internal combustion

   b. External combustion

3. Match the terms associated with the parts of the combustion engine with the proper definition by writing each number on the right in the correct blank on the left.

   _____a. The lower part of the piston

   _____b. The part of the piston through which the piston pin is inserted

   _____c. The part of the valve that comes into contact with the valve seat

   1. Piston boss
   2. Valve face
   3. Piston skirt

_____d. The housing within which the crankshaft and many other engine parts operate and are oiled

_____e. Area on the engine with which the valve face comes in contact

_____f. Pieces of metal used to secure the valve spring onto the valve

_____g. Connects a rod to the piston

_____h. Device used to start or stop the flow of the air-gas mixture

_____i. A replaceable load-carrying part

_____j. The shaft containing lobes or cams

_____k. The journal for a bearing in the small end of a connecting rod

_____l. A flexible piece of metal used to seal the piston with the cylinder walls during the power and compression strokes

_____m. A round part closed on one end

_____n. Main framework of the piston engine

_____o. A shaft connecting the piston to the crankshaft

_____p. The main shaft running through the engine

_____q. Cuts down on friction

_____r. Provides space to mount external parts

_____s. Installed in a cylinder hole

_____t. Allows fuel to come into the engine

_____u. Used to open the engine valves

4. Crankcase
5. Keepers
6. Piston pin
7. Valve seat
8. Camshaft
9. Valve
10. Bearing
11. Piston
12. Block
13. Connecting rod
14. Ring
15. Crankshaft

_____v. Transfers the force of the explosion from the piston to the crankshaft

_____w. Converts the up and down motion of the piston to usable rotary power

_____x. Houses all internal parts

_____y. Transfers force of explosion to a connecting rod

4. Arrange the events of a power sequence in order, beginning with explosion over piston.

_____a. Explosion over piston

_____b.

_____c.

_____d.

_____e.

_____f.

_____g.

_____h.

1. Push rod drives the rocker arm
2. Piston drives rod
3. Rocker arm opens valve
4. Camshaft drives the lifter
5. Rod drives the crankshaft
6. Lifter raises the push rod
7. Crankshaft drives the camshaft

5. Determine the function of each type of ring used on the piston by placing the correct number to the left of each letter.

_____a. Compression ring

_____b. Wiper ring

_____c. Oil ring

1. Seals the piston within the cylinder and prevents explosion "blow-by"
2. Wipes the oil off the cylinder wall back into the oil pan on the downward movement of the piston
3. Applies oil to the cylinder wall on the upward stroke of the piston

6. Determine the functions of a flywheel by answering **yes** or **no** to each of the following statements.

_____a. The flywheel acts as a balance to smooth the engine.

_____b. The flywheel provides a gear to turn the water pump.

_____c. The flywheel provides a starter gear.

_____d. The flywheel acts as a centrifugal wheel to carry the engine to the next stroke.

_____e. The flywheel changes the direction of rotation to the transmission.

7. Identify the three elements necessary to cause an explosion in the cylinder by placing a "√" mark beside the correct answers below.

_____a. water

_____b. fire

_____c. wind

_____d. air

_____e. fuel

8. Arrange the events necessary to start an engine in the proper order by numbering 1 through 4 for each of the following:

_____a. The correct amount of fuel and air mixes

_____b. The spark fires near the top of the compression stroke, which explodes the gas and pushes the piston downward.

_____c. The fuel and air mixture is pulled into the cylinder through the intake valve.

_____d. The engine is cranked which starts it turning.

9. Match each of the strokes to the function of the four-stroke cycles of a gasoline engine by placing the correct number to the left of each answer.

_____a. As the piston moves downward, the intake valves open to allow the cylinder to be filled with the correct fuel-air mixture.

_____b. As the piston moves upward, both valves close, causing the fuel and air mixture to be compressed into a small area.

1. Compression
2. Intake
3. Exhaust

_____c. This action is not considered a stroke, but an event that occurs, causing the fuel-air mixture to explode.

_____d. The piston begins a downward motion, being forced by expanding burning gases.

_____e. The piston moves upward as the exhaust valve opens, allowing the burned gases to be forced from the cylinder.

4. Ignition
5. Power

10. Point out the function of each of the parts of the valve train by placing the appropriate number to the left of each letter.

_____a. Camshaft
_____b. Lifter
_____c. Push rod
_____d. Rocker arm

1. Pushes the valve open
2. Pushes the rocker arm
3. Raises the push rods
4. The lobes lift the hydraulic lifters

COMPETENCY TEST

MINOR AUTOMOTIVE MAINTENANCE

NAME _____ **DATE** _____

UNIT: Fuel System Operation and Repair

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to discuss the operation of the fuel system and repair each of its components.

DIRECTIONS: Read and answer the following questions in the space provided.

1. Explain the purpose of the automotive fuel system.

2. Match the terms and definitions associated with the fuel system by placing the correct number to the left of each definition:

_____a. Metal plates separating the fuel tank into sections, yet allowing fuel to pass slowly between them

_____b. Device measures quantity of fuel in the fuel tank

_____c. A device made of thin layers of cloth bound together with a special compound that makes it airtight and resistant to petroleum products

_____d. To go from a low speed to a high speed

1. Diaphragm
2. Baffles
3. Sending unit
4. Accelerate

3. Describe the construction of the fuel tank by underlining the correct answer for each of the following sentences:

   a. A metal container for the storage of (water, fuel).

   b. Contains (baffles, floats) to keep the fuel from shifting or sloshing.

   c. Contains a vent so that fuel may (be drawn out, evaporate).

   d. Has a (filler opening, drain plug) to allow fuel to enter the tank.

   e. Houses a sending unit that gives an accurate description of the (rate of flow, amount) of gas in the tank.

4. Select the proper uses of fuel lines by writing **true** or **false** beside each of the following statements:

   _____a. Fuel lines are used to transmit fuel to the engine.

   _____b. Fuel lines are constructed of flexible rubber.

   _____c. Fuel lines are constructed of steel, approximately 5/16-in. in diameter.

5. Point out the operation of the fuel pump by underlining the correct answer for each of the following:

   a. Receives fuel from the fuel tank and (stores it for, sends it to) the carburetor

   b. A (diaphragm, siphon) type pump

   c. Driven by the (crankshaft, camshaft)

6. Locate the different fuel filters and explain the purpose of these filters by answering the following questions by underlining the correct answers:

   a. Fuel filters are located in which of the following?

      (1) in the tank at the fuel suction pick-up

      (2) in the gas-filler spout

      (3) in the engine manifold

      (4) in the fuel pump inlet

      (5) between the pump and carburetor

   b. The purpose of fuel filters is to:

      (1) remove air bubbles from the fuel

      (2) remove dirt and water from the fuel

7. Explain the operation of the carburetor by circling the correct answer for each of the following:

   a. A device that mixes fuel with (water, air, carbon dioxide) for entry into the engine

   b. Mixes fuel and air at a ratio of 13 parts (fuel, air) to 1 part (fuel, air)

   c. Houses three fuel routes:

      (1) idle circuit

      (2) short circuit

      (3) high-speed circuit

      (4) acceleration circuit

COMPETENCY TEST

MINOR AUTOMOTIVE MAINTENANCE

NAME _____ **DATE** _____

UNIT: Electrical System

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to explain the purpose of the electrical system and operation of the electrical system.

DIRECTIONS: Read and answer the following questions in the space provided.

1. List the four functions the electrical system provides power for:
   1.
   2.
   3.
   4.
2. Select the terms describing each factor that determines electricity output by placing the correct letter to the left of each letter.

   _____a. The rate of flow of electricity

   _____b. The measure of resistance to the flow of electricity

   _____c. The pressure with which electricity is forced through a wire

   1. Ohm
   2. Voltage
   3. Amperage

3. Determine the type of currents (AC or DC) produced in each of the different sources.

   _____a. Current supplied by batteries

   _____b. Current used in home electrical systems

4. Match terms with definitions associated with the electrical system.

_____a. The flow of electrons under pressure through a wire

_____b. A coated strand of metal through which electricity flows

_____c. A device for opening or closing the path through which electricity flows

_____d. A soft metal that melts easily, which is used to weld wires together

_____e. A unit in the electrical system designed to give off light

_____f. The fine wire inside the light bulb

_____g. A force applied by types of metals in an electrical system that slows down the flow of electricity

_____h. A basic unit which, when in combination with other units, makes up molecules

_____i. The smallest particle of a substance or material

_____j. A replaceable unit located in a wire that melts to relieve an overload in the electrical system

_____k. A reusable unit located in a wire to relieve an overload in the electrical system before the wire burns up

_____l. The path through which electricity flows

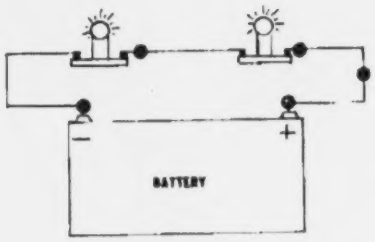
_____m. A wire through which electricity flows

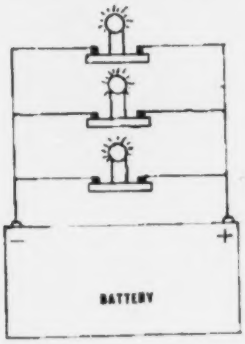
_____n. Checking a wire to see if it will allow current to flow through it by connecting an ohmmeter to each end of the wire

1. Molecule
2. Bulb
3. Solder
4. Resistance
5. Switch
6. Atom
7. Wire
8. Filament
9. Electricity
10. Circuit
11. Conductor
12. Circuit breaker
13. Fuse
14. Continuity test

5. Label each circuit as series or parallel circuits.

_____ a.

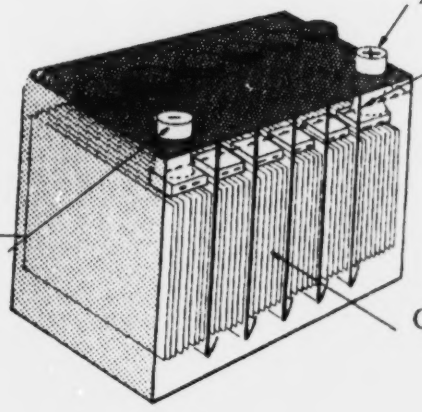




_____ b.

6. Point out the parts of a battery by labeling each of numbered parts with one of the following:

positive post
negative post
electrolyte
cells



A _____

B _____

D _____

C _____

COMPETENCY TEST

MINOR AUTOMOTIVE MAINTENANCE

NAME _____ DATE _____

UNIT: Ignition System

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to inspect, test, and service the ignition system.

DIRECTIONS: Read and answer the following questions in the space provided.

1. Explain the purpose of the ignition system.

2. Match the correct term with each of the component parts of the distributor by placing the number of the part in the blank.

_____a. Distributor cap

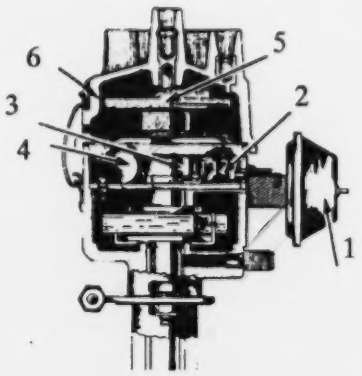
_____b. Rotor

_____c. Cam

_____d. Vacuum advance

_____e. Breaker points

_____f. Condenser



3. Match the term to the correct definition associated with the ignition system.

_____a. A storage place for electricity where chemical energy is converted into electrical energy

_____b. The path through which electricity flows

_____c. Current, as supplied by batteries, that flows in one direction only

_____d. A unit located in a wire or circuit to prevent an overload in the electrical system before the wire burns up

_____e. The connection of an electrical unit to the engine or frame to return current to its source

_____f. A term used for high voltage

_____g. Process of setting fire to a fuel in combustion chamber by means of a spark

_____h. Body of metal that has the ability to attract

_____i. The measure of resistance to the flow of electricity

_____j. The fuel-air mixture ignites or burns before it should

_____k. A magnetically operated switch used to make and break the flow of current in a circuit

_____l. A hot wire in the electrical system that has become grounded

_____m. A device placed in a circuit to lower voltage

1. Relay
2. Ohm
3. Resistor
4. Battery
5. Fuse
6. Short circuit
7. Magnet
8. Circuit
9. High tension
10. Pre-igniting
11. DC
12. Ignition
13. Ground

4. Match the term with the correct description of each component of the ignition system.

_____a.	A storage place for electricity where chemical energy is converted into chemical energy	1. Coil
_____b.	A switch in the cranking circuit of an engine	2. Battery
_____c.	The device used for opening and closing all electrical circuits on an automobile	3. Spark plug
_____d.	A resistor made of a wire which will increase or decrease voltage as the heat of the wire changes	4. Ignition switch
_____e.	A unit used to step up battery voltage to a point necessary to fire a spark plug	5. Starter relay
_____f.	A unit designed to make and break the main ignition circuit and to distribute resulting high voltage to the proper cylinder at the right time	6. Distributor
_____g.	A device with two electrodes which provides an air gap for a spark to jump across and ignite fuel-air mixture in the combustion chamber	7. Ballast resistor

5. Identify the fouling conditions of plugs by placing the correct number in the blanks.

_____a.	Plug has deposits of black dry carbon which are caused from the plugs being too cold, a high level of fuel in the carburetor, excessive choking, or a clogged air cleaner	1. Gap bridging
_____b.	Plugs are covered with wet, black deposits caused by an excessive amount of oil reaching the combustion chamber	2. Aluminum throw-off
_____c.	New plugs coated with splashes of carbon deposits because the plugs were installed in an engine that had heavy deposits of carbon in the combustion chamber	3. Shell bridging
		4. Oil fouling
		5. Fuel fouling
		6. Splashed fouling
		7. High-speed glazing

_____d. A plug fouled with particles of molten aluminum, caused by the piston breaking up due to rapid combustion, pre-ignition, or over-advanced ignition timing

_____e. A plug with a large piece of piston or combustion chamber deposit sticking between the hot insulator and plug shell

_____f. A plug with carbon-lead deposits connecting the two electrodes

_____g. A plug with a hard, shiny, yellowish-tan deposit, caused by a sudden increase in plug temperatures during hard acceleration or loading

6. Match the correct testing equipment with the function of each by placing the number in the blanks.

_____a. A device for checking the gap on spark plug or points, measuring in thousandths

_____b. A testing instrument that measures the number of degrees the distributor cam rotates from the time the points open until they close

_____c. A unit that is connected to the engine ignition system and which produces flashes of light in time with the firing of the No. 1 spark plug

_____d. An instrument used to measure volts in any circuit

1. Timing light
2. Dwell meter
3. Voltmeter
4. Thickness guage

COMPETENCY TEST

MINOR AUTOMOTIVE MAINTENANCE

NAME _____ **DATE** _____

UNIT: Lubrication Systems

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to inspect and service the lubrication system.

DIRECTIONS: Read and answer the following questions in the space provided.

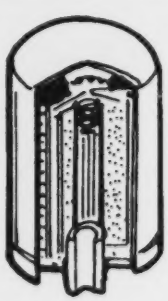
1. Explain the purpose of the lubrication system.

2. Point out the five functions of oil by underlining the letter in front of each correct answer.

   a. Cools
   b. Softens
   c. Cleans
   d. Glues
   e. Cushions
   f. Lubricates
   g. Seals

3. Select the proper type of oil filter by writing the correct name for each of the following filters.

   a._____ b._____



4. Match the terms on the right to the correct definition associated with the lubrication system.

_____a. Resistance to any motion between two surfaces in contact

_____b. A by-product of petroleum used for lubrication

_____c. A device used to prevent oil leakage past a certain point in the engine

_____d. A part of the lubrication system used to clean the oil

_____e. A device used to force oil through the engine

_____f. Unit using oil to clean air entering the engine

_____g. Any material used to prevent friction between two surfaces

_____h. A unit that drives both rear axles, but will allow them to turn at different speeds when making turns

_____i. A material or solution added to a mixture to increase efficiency

_____j. A metal stick used to measure the oil level in an engine or automatic transmission

_____k. Society of Automotive Engineers

_____l. Motor severe oil

_____m. The part of the engine that holds the oil

1. Oil
2. S.A.E.
3. Sump
4. Friction
5. Additive
6. Oil seal
7. Oil pump
8. Differential
9. Lubricant
10. MS
11. Dipstick
12. Oil Filter
13. Oil bath cleaner

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5. Pick out the types of lubrication systems from the following list by underlining each correct answer.

   a. Slow-drip oiling
   b. Full-pressure oiling
   c. Splash oiling
   d. Combination slow-drip and splash oiling
   e. Combination full-pressure and splash oiling

6. Point out the factors that cause lubricants to break down by writing **yes** or **no** in front of each of the following.

   _____a. Moisture
   _____b. Freezing
   _____c. Sunlight
   _____d. Excessive heat
   _____e. Dirt
   _____f. Misuse
   _____g. High engine RPM

7. Choose from the list at right the correct type of lubricant used in each of the vehicle areas listed at left.

   _____a. For use in the engine
   _____b. Used on ball joints, wheel bearings, and u-joints
   _____c. For use in manual transmissions
   _____d. For use in automatic transmissions

   1. Grease
   2. Gear oil
   3. Motor oil
   4. ATF lubricant

COMPETENCY TEST

MINOR AUTOMOTIVE MAINTENANCE

NAME _____ **DATE** _____

UNIT: Engine Cooling System

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to inspect, test, and service the parts within the cooling system.

DIRECTIONS: Read and answer the following questions in the space provided.

1. Explain the purpose of the cooling system.

2. Point out the three functions of the cooling system by answering **yes** or **no** to each of the following statements.

   _____a. Brings coolant and engine up to operating temperature quickly

   _____b. Stores heat to fire the fuel-air mixture in the cylinders

   _____c. Keeps coolant and engine at an even temperature

   _____d. Cools exhaust system

   _____e. Removes unwanted heat

3. Match the terms with the definitions associated with the cooling system.

_____a. A square unit located in front of the engine, filled with coolant, from which heat generated in the engine leaves the system

_____b. A unit designed to move coolant through the cooling system

_____c. A unit located in the engine head outlet that controls engine coolant temperature

_____d. Connects radiator to the engine and water pump

_____e. Seals the radiator and allows the system to operate under pressure

_____f. A liquid made of ethylene glycol that prevents the coolant from freezing, and aids in overheating problems

_____g. A unit located to the rear of the radiator that pulls air through the radiator and is driven by belts from the crankshaft

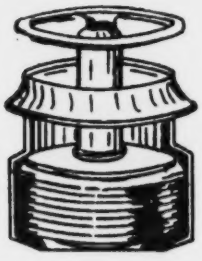
_____h. A device mounted on the fan hub that allows the fan to cut out at speeds over 50 mph

_____i. A flexible rubber and steel strap used to drive the water pump from the crankshaft by pulleys

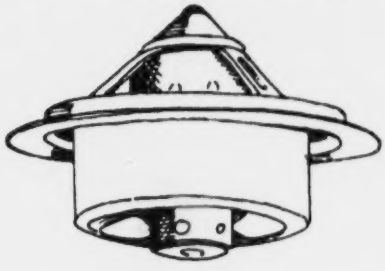
1. Belt
2. Fan
3. Water pump
4. Fan clutch
5. Antifreeze
6. Radiator
7. Hoses
8. Thermostat
9. Radiator cap

4. Select the correct type of thermostat by labeling each of the illustrations with either **bellows** or **pellet.**

a._____



b._____



5. Point out the types and uses of antifreeze by underlining the correct answer for each of the following questions.

   a. The two types of antifreeze are (permanent, replaceable) ethylene glycol and (permanent, replaceable) alcohol antifreeze.

   b. Antifreeze has a much (higher, lower) freezing point than water.

   c. The (ethylene glycol, alcohol) type prevents boil over during hot weather.

   d. It is (poisonous, non-poisonous) if swallowed.

   e. The useful life of most antifreeze is (24 months, 24 years).

   f. It (will, will not) remove paint from car bodies.

COMPETENCY TEST

MINOR AUTOMOTIVE MAINTENANCE

NAME _____ **DATE** _____

UNIT: Exhaust System

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to examine and replace components of the exhaust system.

DIRECTIONS: Read and answer the following questions in the space provided.

1. Explain the purpose of the exhaust system.

2. Match the terms and definitions associated with the exhaust system.

_____a.	The collecting point of the burned gases as they leave the engine cylinders	1. Muffler
_____b.	Pipe that carries the gases to the muffler	2. Carbon monoxide
_____c.	A device that silences the exhaust noises and routes the burned gases into the tail pipe	3. Brake pressure
_____d.	A device used in addition to the muffler to further dampen exhaust pulsations	4. Exhaust manifold
_____e.	A building up of exhaust gases because the muffler does not allow the burned gases to pass through freely	5. Exhaust pipe
_____f.	A poisonous gas within the exhaust gases	6. Catalytic converter

3. Determine the route of the exhaust gases from the time they are created to when they are discharged to the air by numbering the order of the following events.

_____a. The gases pass through a catalytic converter into the exhaust pipe.

_____b. After they leave the valve ports they collect in the exhaust manifold.

_____c. Exhaust gases are created by the partial burning of the fuel-air mixture in the cylinders.

_____d. The exhaust pipe transfers the gases to the muffler where they are discharged to the atmosphere through a tailpipe.

_____e. Exhaust gases leave the cylinders through the valve port.

4. Select the correct exhaust system tools and materials for each of the jobs associated with exhaust system repair.

_____a. Used in cutting welded mufflers free and in removing tail and exhaust pipes

_____b. Used for cutting pipes smoothly

_____c. Used in heating pipe joints to loosen the connection

_____d. Used to expand pipe ends for better joint fits

_____e. Used to straighten crimped or distorted pipe ends

_____f. Provides a good grip on pipe to help in pipe alignment or removal

_____g. Allows the joints to slide together easier, assists in alignment, and prevents exhaust leaks

_____h. Helps in loosening fasteners and clamps

1. Pipe and straightening cone
2. Pneumatic chisel
3. Electric pipe joint heater
4. Penetrating oil
5. Chain wrench
6. Pipe expanding tool
7. Hand-operated pipe cutter
8. Exhaust system sealer

COMPETENCY TEST
MINOR AUTOMOTIVE MAINTENANCE

NAME _____ DATE _____

UNIT: Wheels and Tires

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to discuss the care and handling of wheels and tires.

DIRECTIONS: Read and answer the following questions in the space provided.

1. Match the terms on the right to the correct definition:

_____a. A wheel made of light alloy metal; usually lightweight, sporty, comes in many sizes

_____b. Rim having two safety ridges, to prevent the tire from leaving the rim in event of blowout

_____c. Even distribution of weight around the axis of rotation

_____d. Balancing for both static and dynamic balance

_____e. Part of tire between tread and bead of tire

_____f. Part of tire that contacts the road

_____g. Condition that causes front tires to hop up and down

_____h. Fasteners that hold the wheel to the hub

_____i. Machine on which to balance wheels

1. Mag wheel
2. Safety rim
3. Tire sidewall
4. Tramp
5. Dynamic balance
6. Static balance
7. Tire balancer
8. Tire tread
9. Lug bolt and nut

2. Select the proper safety rules associated with wheels and tires by placing a " √ " in front of each that is correct.

_____a. Use jack stands only when the complete car is lifted off the ground.

_____b. Place jack stands anywhere they will easily fit.

_____c. Tighten lug nuts securely.

_____d. Do not replace tires until they become slick.

_____e. Keep the front end aligned.

_____f. Rotate tires at 5,000 mile intervals.

_____g. Inflate tires rapidly because there is no danger.

_____h. Keep hands and fingers from between bead and flange when inflating tires.

_____i. Observe tire wear patterns.

_____j. Inflate tires until they feel tight.

_____k. Use a rubber lubricant only when mounting new tires.

_____l. Hand-tool safety does not apply to tire changing.

3. List five faults you may find when inspecting a damaged wheel.

a.

b.

c.

d.

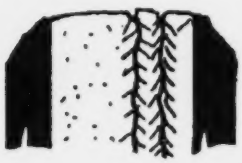
e.

4. Determine the causes of improper tire wear by writing one of the following conditions by each illustration.

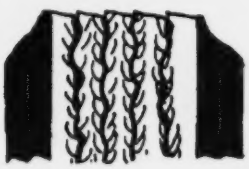
Under-inflation
Over-inflation
Excessive cornering speed
Incorrect toe-in or toe-out adjustment
Incorrect camber adjustment

a. _____

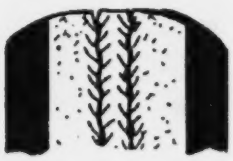
b. _____



c. _____



d. _____



e. _____

5. Name the method of repairing a punctured tire.

6. Explain the purpose of rotating tires.

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COMPETENCY TEST
MINOR AUTOMOTIVE MAINTENANCE

NAME _____ **DATE** _____

UNIT: Brake and Bearing Systems

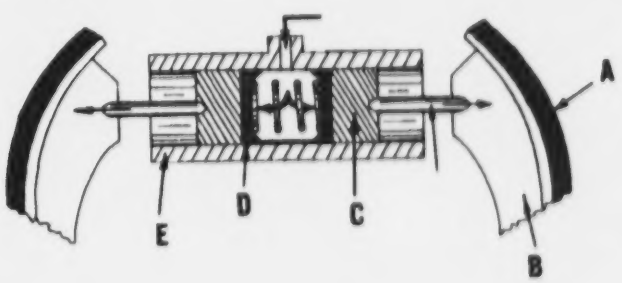
UNIT OBJECTIVE: After completing this unit, the student(s) will be able to discuss and replace components of the bearing system.

DIRECTIONS: Read and answer the following questions in the space provided

1. Explain the purpose of the brake system.

2. Identify the components of the wheel cylinder by placing each of the parts names listed below in the correct blank.

   Wheel cylinder Brake lining Cup
   Piston Brake shoe



a. _____ d. _____

b. _____ e. _____

c. _____

3. Match the terms and definitions associated with the brake system.

_____a. The part of the hydraulic system in which pressure is generated

_____b. The part of the system that receives pressure from the master cylinder and applies it to brake shoes in the brake drum

_____c. The part of the brake system with an attached brake lining which creates friction when it comes into contact with the brake drum

_____d. A cast iron or aluminum housing, bolted to the wheel, that rotates around the brake shoes and gives a surface for the brake shoes to rub against

_____e. A brake system which uses a steel disc with a caliper type of lining holder instead of the internal brake shoe type

_____f. A clamping device which houses the hydraulic cylinder and pads on the disc brake

_____g. A type of brake lining used with disc brakes

_____h. A rigid steel plate to which the brake shoes are attached

_____i. A special fluid designed for the hydraulic brake system

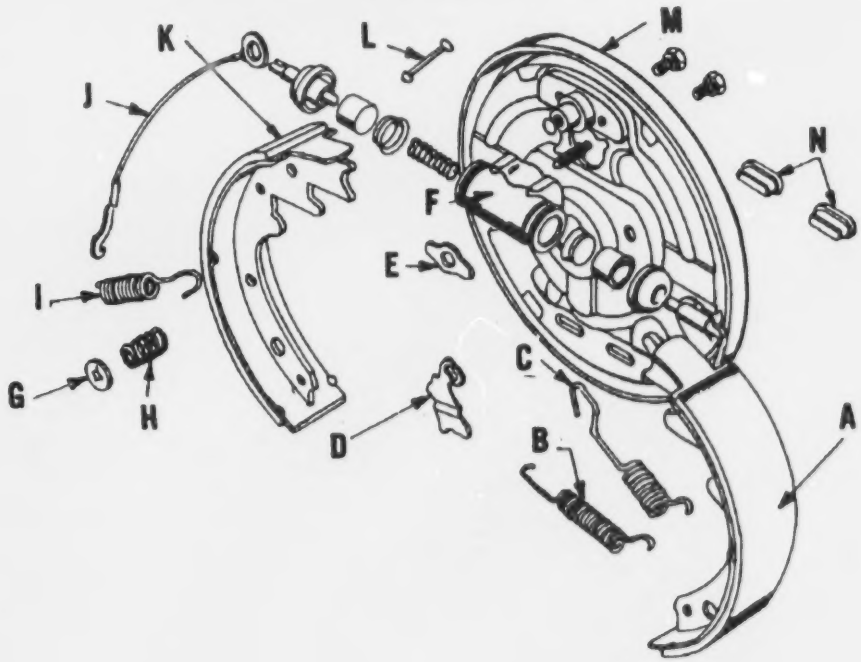
_____j. Removing the air from the hydraulic system

_____k. A reduction in braking force due to loss of friction between brake shoes and drum, caused by heat buildup

1. Wheel cylinder
2. Bleeding the brakes
3. Caliper
4. Brake fluid
5. Pads
6. Brake-backing plate
7. Brake fade
8. Master cylinder
9. Brake drum
10. Disc brakes
11. Brake shoes

4. Identify the components of the brake mechanism by placing each of the parts names listed below in the correct blank.

Primary shoe
Secondary shoe
Secondary return spring
Parking brake cable
Hold-down pin
Hole covers
Retainer
Spring
Adjusting lever
Wheel cylinder assembly
Backing plate
Anchor pin plate
Primary return spring
Lever return spring



a. _____ h. _____

b. _____ i. _____

c. _____ j. _____

d. _____ k. _____

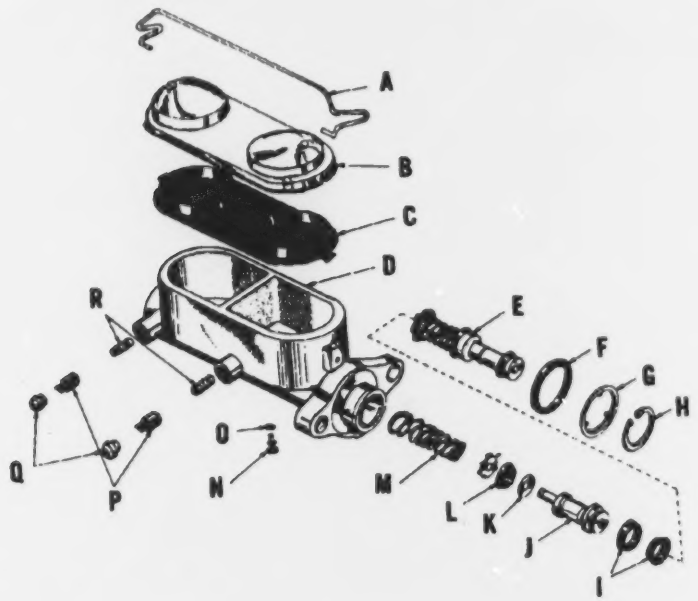
e. _____ l. _____

f. _____ m. _____

g. _____ n. _____

5. Identify the components of the master cylinder by writing the name of each lettered part in the corresponding blank below.

Reservoir cover	Vent seal retainer	Primary seal
Reservoir seal	Floating piston stop bolt	Snap ring
Retainer	Check valves	Floating piston spring
Master cylinder casting	Secondary seals	O-ring
Rear piston assembly	Floating piston	Tube seat inserts
Vent seal	Protector washer	Check valve springs



a._____ j._____

b._____ k._____

c._____ l._____

d._____ m._____

e._____ n._____

f._____ o._____

g._____ p._____

h._____ q._____

i._____ r._____

6. Point out the cause of each of the brake system malfunctions by placing the correct number by each malfunction.
Note: *You may place several numbers by each letter.*

_____a. Low pedal

_____b. A bearing that has been lubricated at the factory and sealed

_____c. Spongy pedal

_____d. Excess pedal pressure required to stop car

_____e. Inner and outer ring on which ball bearings run

_____f. Pulsating brake pedal

_____g. Brakes fade

_____h. Brakes drag when properly adjusted

_____i. A bearing with tapered steel rollers between an inner and outer race

_____j. One wheel drags

_____k. Rear brakes drag

_____l. Car pulls to one side

_____m. An inner and outer race separated by steel balls

1. Grease on several linings
2. Drums out of round
3. Pedal not returning to stop
4. A broken retracting spring
5. Improper parking brake adjustment
6. Air trapped in system
7. Disc warped
8. Low fluid level
9. Incorrect lining on one side
10. Linings not properly contracting
11. A frozen master cylinder
12. Drums worn too thin
13. Tapered roller bearing
14. Ball bearing
15. Race
16. Sealed bearing

COMPETENCY TEST

MINOR AUTOMOTIVE MAINTENANCE

NAME _____ DATE _____

UNIT: Frame, Suspension and Steering

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to identify major steering and suspension components.

DIRECTIONS: Read and answer the following questions in the space provided.

1. Match the terms and definitions associated with frame, suspension, and steering.

_____a.	Holds the hub assembly, upper and lower ball joints, shock absorbers, and assists in holding coil springs in place	1. Grommet
_____b.	An eyelet of rubber that protects an opening or insulates something passed through it	2. Strut shaft
_____c.	A tubular oil-filled device that absorbs action of the springs	3. Control arms
_____d.	A cup-shaped metal washer used to hold the grommet in place	4. Upper mounting bracket
_____e.	A piece of metal that extends from the frame at the location of each spring assembly to hold one end of the shock absorber.	5. Shock absorber
_____f.	A shaft extending from the frame to hold one end of the shock absorber	6. Retainer cup
_____g.	The mounting of upper and lower ball joints, brake backing plate, front wheel hub, and tie rod ends	7. Shackles
		8. Intermediate rod
		9. Stud
		10. Coil assembly

_____h. Brackets used for mounting leaf springs to the frame

_____i. An L-shaped rod that mounts to the frame and the intermediate rod that helps support the steering linkage

_____j. The center link of the steering linkage

_____k. A flexible joint with a ball-and-socket type of construction that is used in steering linkage

_____l. A straight or tapered metal rod with threads on either or both ends

_____m. A springy steel bar mounted to the frame and lower control arm to control body sway and leaning when cornering

_____n. A spiral-wound spring used on front and rear suspensions

_____o. A flat spring-steel suspension spring made of one or more pieces and used mainly on the rear axle assembly

_____p. A gear box located on the end of the steering column that contains the gears necessary to multiply the turning force

_____q. A tubular housing mounted to the dash that contains a steering gear shaft to which the steering wheel is mounted

11. Spindle assembly
12. Ball joint
13. Idler arm
14. Stabilizer
15. Steering gear
16. Leaf spring
17. Steering column

2. Identify the two types of frames described below as either a "conventional type" or an "integral type."

_____a. The frame and body are a single unit with all sections welded together.

_____b. The frame is a separate part, and the body is bolted together.

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3. List the two types of suspension systems.

   a.

   b.

4. Point out the advantages of independent suspension by placing a " √ " in front of each.

   _____a. Keeps wheels aligned

   _____b. Prevents flat tires

   _____c. Eliminates the use of shock absorbers

   _____d. Does not transfer the tipping action of the body

5. Identify the components of the front suspension from the list.

   lower ball joint
   upper control arm
   coil spring
   upper ball joint
   lower control arm
   steering knuckle
   shock absorber

   a. _____

   b. _____

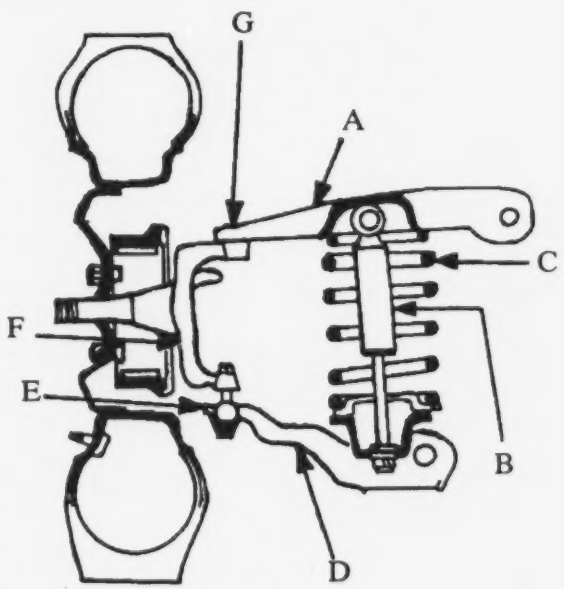
   c. _____

   d. _____

   e. _____

   f. _____

   g. _____



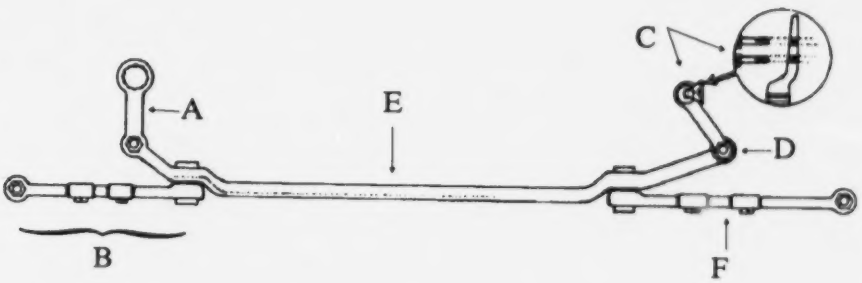
6. Identify the components of the steering linkage from the list.

tie rod	idler arm support
idler arm	center link
pitman arm	adjustment sleeve

a. _____ d. _____

b. _____ e. _____

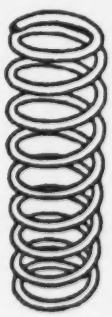
c. _____ f. _____



7. Identify each of the types of springs from the list.

multi-leaf spring	single leaf spring
coil spring	torsion bar spring

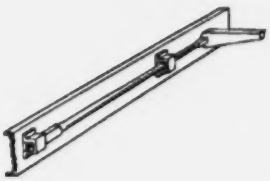
a. _____



b. _____

c. _____

d. _____



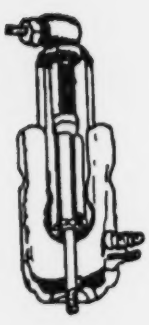
8. Identify each of the types of shock absorbers from the list.

Superlift
Air adjustable
Telescopic
Strut

a. _____

b. _____

c. _____



d. _____

COMPETENCY TEST

MINOR AUTOMOTIVE MAINTENANCE

NAME _____ DATE _____

UNIT: Drive Line

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to identify, adjust, and replace parts of the drive line.

DIRECTIONS: Read and answer the following questions in the space provided.

1. Match the terms and definitions associated with drive lines.

_____a. A tube with flexible joints at each end that connects the transmission and differential

_____b. An X-shaped unit that allows flexibility in the shaft between the transmission and differential

_____c. The last unit of the power train that allows for the different speeds of the rear wheels when turning a corner

_____d. A unit in the power train used with clutching system that allows the operator to select various gears by manually shifting

_____e. A spring-loaded metal plate with a fiber coating that absorbs the shock of engine torque

_____f. A metal disc bolted directly to the fly wheel that puts pressure on the clutch disc, putting the vehicle in motion.

1. Standard transmission
2. Propeller shaft
3. Clutch disc
4. Pressure plate
5. Differential
6. Universal joint
7. Clutch fork
8. Throw-out bearing
9. Axle shafts
10. Clutch pedal
11. Clutch linkage

_____g. A forked device that holds the throw-out bearing in place and is connected to the clutch pedal linkage

_____h. A bearing used to depress the pressure plate fingers which engages the clutch disc

_____i. An adjustable metal rod located between the clutch pedal and clutch throw-out fork

_____j. A device located inside the vehicle next to the steering column which allows the driver to engage or disengage the clutch

_____k. Shafts that transfer the power from the differential to the rear wheels

2. Identify the components of the drive line from the list below.

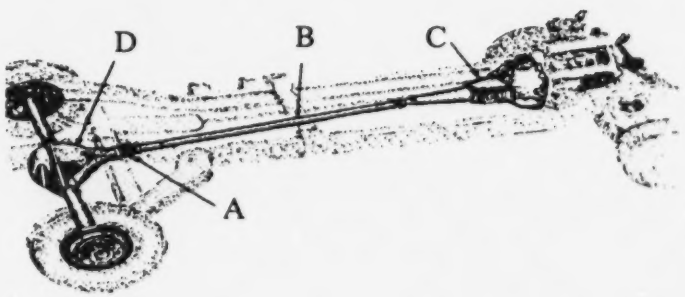
Transmission
Universal joint
Propeller shaft
Differential

a._____

b._____

c._____

d._____



3. Identify the components of the clutch assembly from the list below.

Flywheel
Pressure plate assembly
Bell housing
Throw-out bearing
Clutch fork

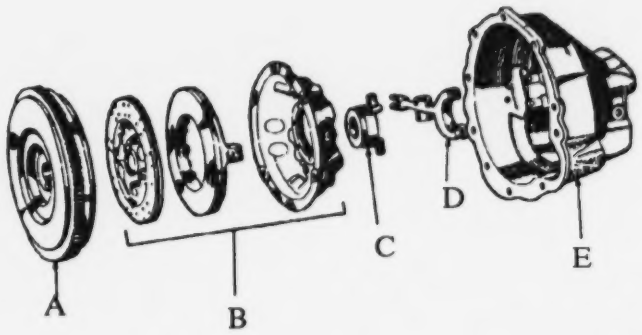
a._____

b._____

c._____

d._____

e._____



4. Explain the ratio of standard transmission gears by circling the correct answer for each of the following.

   a. When the transmission is in first gear, the engine is turning (2, 3, 4) times as fast as the drive shaft.

   b. When the engine is turning twice as fast as the drive shaft, the transmission is in (first, second, third) gear.

   c. When the transmission is in third gear, the drive shaft will be turning (faster than, the same as, slower than) the engine.

   d. The gear ratio of the transmission to drive shaft when the transmission is in reverse is (1 to 1, 2 to 1, 2.5 to 1, 3.5 to 1).

COMPETENCY TEST

MINOR AUTOMOTIVE MAINTENANCE

NAME _____ DATE _____

UNIT: Cleaning the Car

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to identify cleaning materials and equipment, clean interior and exterior of the car and wax surfaces.

DIRECTIONS: Read and answer the following questions by circling **T** for true or **F** for false.

T F 1. The chamois is used to clean dust from car finish.

T F 2. The instructions should be read each time cleaners are used.

T F 3. A soft towel is used when cleaning the tires.

T F 4. The chamois is used to remove water spots.

T F 5. Using a dry cloth to wipe dust from a car will scratch the finish.

T F 6. Washing the car in the hot sun will not damage the finish.

T F 7. A bucket, sponge and warm water should be used to wash the car.

T F 8. Some cleaners will cause skin irritation.

T F 9. You should not clean under the windshield wipers.

T F 10. Chrome polish will not retard rust.

T F 11. A silicon lubricant will help preserve the rubber on tires.

T F 12. Vinyl tops are cleaned with a soft rag.

T F 13. Mild soap or detergent should be used to clean vinyl tops.

T F 14. A hard paste wax gives the best protection for a finish on the car.

T F 15. Saddle soap is used to clean leather seats.

COMPETENCY TEST

SMALL ENGINE REPAIR

Name_____ Date_____

UNIT: Engine Principles

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to identify and discuss the four-cycle engine components and demonstrate the ability to show the difference between engines.

DIRECTIONS: Read and answer the following questions in the space provided.

1. Explain the purpose of the combustion engine.

2. Point out the differences between the internal and external combustion engines.

   a. Internal combustion

   b. External combustion

3. Match the terms associated with the parts of the combustion engine with the proper definition by writing each number on the right in the correct blank on the left.

_____a.	The lower part of the piston	1. Piston boss
_____b.	The part of the piston through which the piston pin is inserted	2. Valve face

_____c. The part of the valve that comes into contact with the valve seat

_____d. The housing within which the crankshaft and many other engine parts operate and are oiled

_____e. Area on the engine with which the valve face comes in contact

_____f. Pieces of metal used to secure the valve spring onto the valve

_____g. Connects a rod to the piston

_____h. Device used to start or stop the flow of the air-gas mixture

_____i. A replaceable load-carrying part

_____j. The shaft containing lobes or cams

_____k. The journal for a bearing in the small end of a connecting rod

_____l. A flexible piece of metal used to seal the piston with the cylinder walls during the power and compression strokes

_____m. A round part closed on one end

_____n. Main framework of the piston engine

_____o. A shaft connecting the piston to the crankshaft

_____p. The main shaft running through the engine

_____q. Cuts down on friction

_____r. Provides space to mount external parts

_____s. Installed in a cylinder hole

_____t. Allows fuel to come into the engine

_____u. Used to open the engine valves

_____v. Transfers the force of the explosion from the piston to the crankshaft

3. Piston skirt
4. Crankcase
5. Keepers
6. Piston pin
7. Valve seat
8. Camshaft
9. Valve
10. Bearing
11. Piston
12. Block
13. Connecting rod
14. Ring
15. Crankshaft

_____w. Converts the up and down motion of the piston to usable rotary power

_____x. Houses all internal parts

_____y. Transfers force of explosion to a connecting rod

4. Arrange the events of a power sequence in order, beginning with explosion over piston.

1 a. Explosion over piston

_____b.

_____c.

_____d.

_____e.

_____f.

_____g.

_____h.

2. Push rod drives the rocker arm
3. Piston drives rod
4. Rocker arm opens valve
5. Camshaft drives the lifter
6. Rod drives the crankshaft
7. Lifter raises the push rod
8. Crankshaft drives the camshaft

5. Determine the function of each type of ring used on the piston by placing the correct number to the left of each letter.

_____a. Compression ring

_____b. Wiper ring

_____c. Oil ring

1. Seals the piston within the cylinder and prevents explosion "blow-by"
2. Wipes the oil off the cylinder wall back into the oil pan on the downward movement of the piston
3. Applies oil to the cylinder wall on the upward stroke of the piston

6. Determine the functions of a flywheel by answering **yes** or **no** to each of the following statements.

_____a. The flywheel acts as a balance to smooth the engine.

_____b. The flywheel provides a gear to turn the water pump.

_____c. The flywheel provides a starter gear.

_____d. The flywheel acts as a centrifugal wheel to carry the engine to the next stroke.

_____e. The flywheel changes the direction of rotation to the transmission

7. Identify the three elements necessary to cause an explosion in the cylinder by placing a " √ " mark beside the correct answers below.

_____a. water

_____b. fire

_____c. wind

_____d. air

_____e. fuel

8. Arrange the events necessary to start an engine in the proper order by numbering 1 through 4 for each of the following.

_____a. The correct amount of fuel and air mixes

_____b. The spark fires near the top of the compression stroke, which explodes the gas and pushes the piston downward.

_____c. The fuel and air mixture is pulled into the cylinder through the intake valve.

_____d. The engine is cranked which starts it turning.

9. Match each of the strokes to the function of the four-stroke cycles of a gasoline engine by placing the correct number to the left of each answer.

_____a.	As the piston moves downward, the intake valves open to allow the cylinder to be filled with the correct fuel-air mixture.	1. Compression
_____b.	As the piston moves upward, both valves close, causing the fuel and air mixture to be compressed into a small area.	2. Intake
_____c.	This action is not considered a stroke, but an event that occurs, causing the fuel-air mixture to explode.	3. Exhaust
_____d.	The piston begins a downward motion, being forced by expanding burning gases.	4. Ignition
_____e.	The piston moves upward as the exhaust valve opens, allowing the burned gases to be forced from the cylinder.	5. Power

10. Point out the function of each of the parts of the valve train by placing the appropriate number to the left of each letter.

_____a.	Camshaft	1. Pushes the valve open
_____b.	Lifter	2. Pushes the rocker arm
_____c.	Push rod	3. Raises the push rods
_____d.	Rocker arm	4. The lobes lift the hydraulic lifters

COMPETENCY TEST

SMALL ENGINE REPAIR

NAME _____ **DATE** _____

UNIT: Principles of Carburetion

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to discuss the operation of the fuel system and repair each of its components correctly.

DIRECTIONS: Read and answer the following questions in the space provided.

1. State the purpose of the fuel system.

2. Three types of fuel supply systems are
   a.
   b.
   c.
3. Two types of carburetors are _____ and_____.
4. Describe the venturi.

5. The needle valve serves what purpose?

6. Match the fuel system components

_____a. Is used as a reservoir for engine fuel

_____b. Prevents dirt or foreign matter from entering the carburetor

_____c. Mixes the proper proportion of fuel and air for a combustible mixture

_____d. Carries the fuel from the fuel tank to the carburetor.

_____e. Sheet of material flexible enough to permit vibration

1. Fuel line
2. Fuel Tank
3. Carburetor
4. Pump diaphragm
5. Fuel filter

7. The engine part that mixes the air and fuel is the _____.

8. Explain the advantage of a diaphragm carburetor.

9. Explain the purpose of the choke.

10. Explain the function of the throttle.

11. Name the two types of governor systems.

12. Match the governor system components on the right with their correct purposes.

Air vane

_____1. Connection between throttle control and throttle valve shaft

_____2. Connects air vane to the throttle valve shaft

_____3. Provides pneumatic pressure in relationship to engine RPM

_____4. Senses air movement and opens or closes throttle

_____5. Regulates engine speed

a. Control spring

b. Flywheel

c. Linkage

d. Air vane

e. Throttle control

Mechanical

_____1. Transfers the control adjustments to the control spring

_____2. Provides tension to control arm

_____3. Senses engine RPM and controls governor control arm

_____4. Regulates the engine speed

_____5. Connects the control arm to the throttle shaft

_____6. Transfers flyweight/counterweight action to throttle link.

a. Flyweights/counterweights

b. Control arm

c. Control spring

d. Throttle linkage

e. Throttle rod

f. Throttle control

COMPETENCY TEST

SMALL ENGINE REPAIR

NAME_____ **DATE**_____

UNIT Lubrication Systems

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to inspect and service the lubrication system properly.

DIRECTIONS: Read and answer the following questions in the space provided.

1. Match the terms associated with the lubrication system by placing the correct number to the left of each definition.

_____a. Oils compounded to behave as light oils at cold temperatures and heavy oils at warm temperatures

_____b. Society of Automotive Engineers

_____c. American Petroleum Institute

_____d. A measure of the fluidity of an oil at a given temperature

_____e. A device rotated by the camshaft for splashing oil

_____f. Cover on the bottom of the engine block that provides a reservoir for the engine oil

_____g. Device used to remove abrasive particles from the oil

_____h. Device fastened to a connecting rod as a means of splashing oil

1. SAE
2. Viscosity
3. API
4. Multi-grade oil
5. Oil pan
6. Oil filter
7. Slinger
8. Dipper
9. "W" oils
10. Friction

_____i. Types of oils that are suitable for winter service

_____j. Resistance to movement between two objects placed in contact with each other

2. Indicate which of the two lubrication systems is the splash system type?

_____a. Barrel and plunger type, gear and rotor type

_____b. Dipper type, slinger type

3. Complete the functions of engine oil by correctly filling in the blanks.

a. Reduces _____ and wear

b. _____ moving parts

c. Helps seal _____

d. Keeps parts _____

4. How are most two stroke cycle engines lubricated?

5. Where is the service rating of an oil found?

6. Complete the following statements concerning SAE viscosity.

a. Oils vary in viscosity as _____ changes.

b. Lighter oils for winter use are specified at _____ degrees F and carry a 5W, 10W or 20W symbol.

c. The thicker type oil receives a _____ such as SAE 40 or SAE 50.

d. Body is a common term used for _____.

7. How does premix oil and fuel enter the engine?

8. What is pressure lubrication?

9. When are "W" oils used most?

10. Explain how oil cools the engine.

COMPETENCY TEST

SMALL ENGINE REPAIR

NAME_____ **DATE**_____

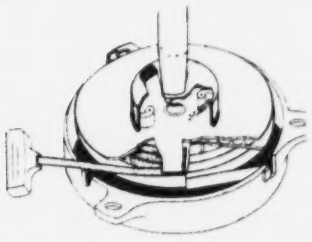
UNIT: Starter Systems

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to remove and replace a starter and identify and discuss components of the starter system.

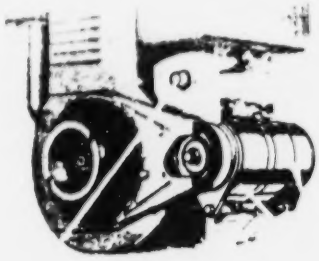
DIRECTIONS: Read and answer the following questions in the space provided.

1. Identify the types of small gas engine starters.

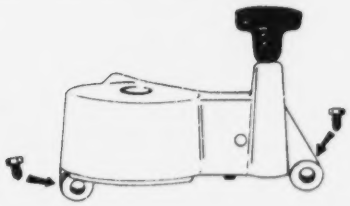
a._____



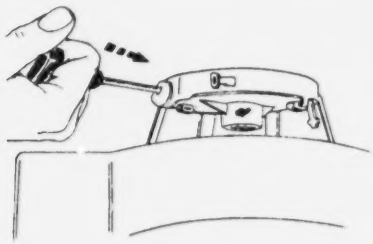
b._____



c._____



d._____



2. Explain the purpose of a starter.

3. The two basic type starters are:

4. Name three of the most common starters.

5. Explain why the rope-rewind starter is more automatic than the rope-wind starter.

6. The most common type electric starter drive is _____.

7. The electric starter can be tested with a _____ voltmeter.

8. In what way will current flow from the battery to the starter generator?

9. The _____ controls the amount of charge to the battery.

10. Explain what would happen if the battery is overcharged and gets too hot.

COMPETENCY TEST

SMALL ENGINE REPAIR

NAME_____ **DATE**_____

UNIT: Measurement and Instruments

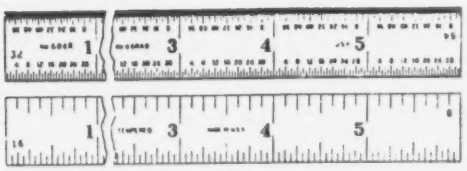
UNIT OBJECTIVE: After completing this unit, the student(s) will be able to use a micrometer, vernier caliper, dial indicator, telescoping gauge and other measuring instruments, and discuss the use of measuring instuments.

DIRECTIONS: Read and answer the following questions in the space provided.

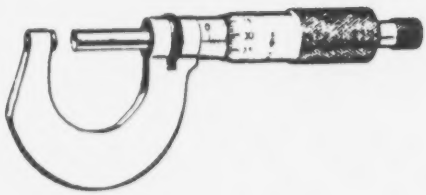
1. Match the terms on the right with their correct definitions.

_____ a.	Low precision measuring instrument graduated in fractional or decimal parts of an inch	1. Graduation
_____ b.	Marking found on rules and scales to denote unit of length	2. Reliable measure
_____ c.	Mistake in the reading or total measurement	3. Vernier caliper
_____ d.	Accurate or true measurement	4. Steel rule
_____ e.	Starting point of measurement for both workpiece and rule	5. Reference point
_____ f.	Makes accurate inside and outside measurements to within one-thousandth of an inch, or one-hundredth of a millimeter	6. Error

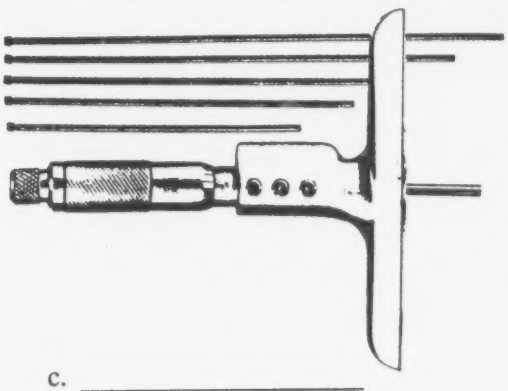
2. Identify measuring instruments used in small engine repair.



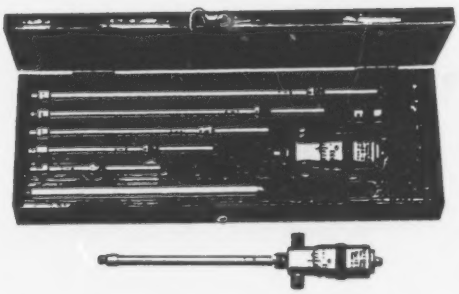
a. _____



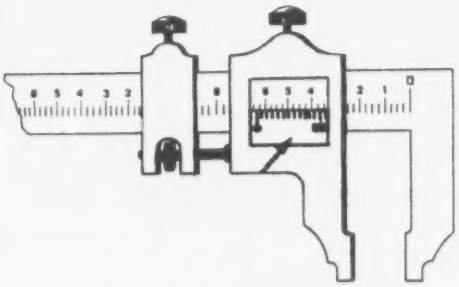
b. _____



c. _____



d. _____



e. _____

f. _____

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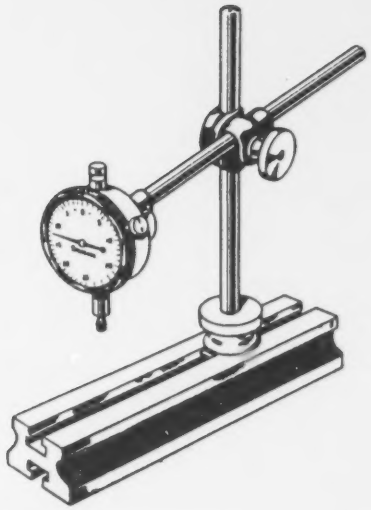


g. _____ h. _____

3. Complete the following list of steps for reading measuring instruments by correctly filling in the blanks.

   a. Select _____ of the required units

   b. Total the number of _____

   c. Count _____ units

   d. _____ graduations to lowest terms

4. Select basic units of measurement found on rules by placing an "X" in the appropriate blanks.

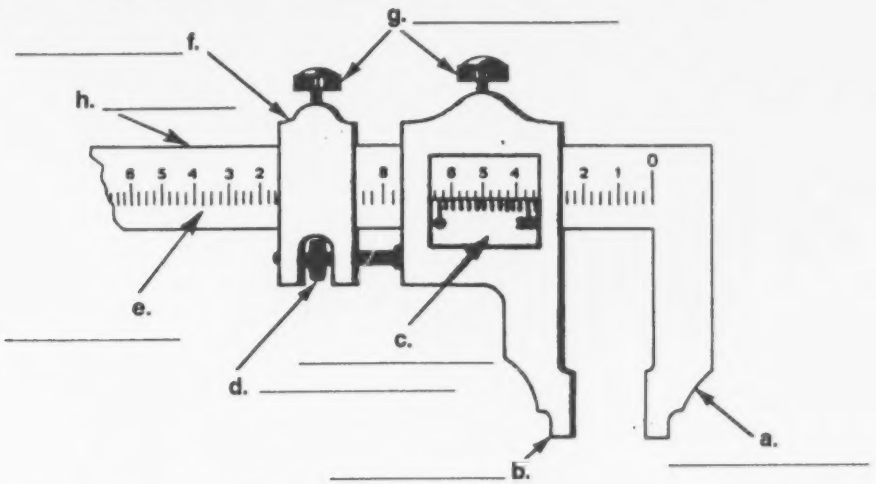
   _____ a. Fractional

   _____ b. Decimal

   _____ c. Integral

   _____ d. Metric

5. Identify the major parts of a vernier caliper.



6. Identify the major parts of an outside micrometer.

a. _____

b. _____

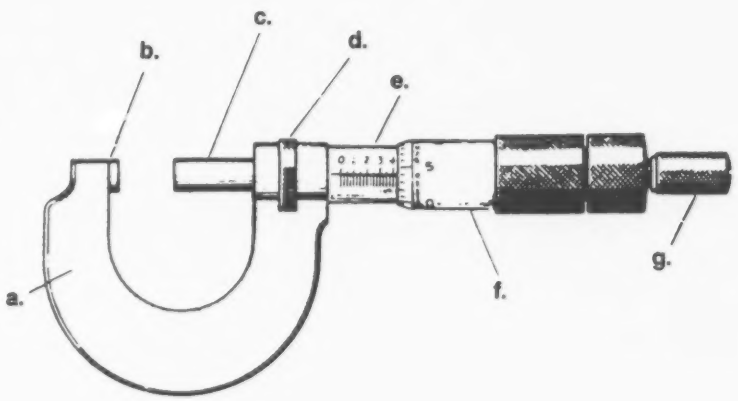
c. _____

d. _____

e. _____

f. _____

g. _____



7. Complete the following list of statements concerning methods for checking the accuracy of outside micrometers by correctly filling in the blanks.

a. 0-in. - 1.000-in.

1) Close _____ and anvil together

2) Observe _____ references on the sleeve and thimble

b. More than one inch

1) Use a standard bar or disc to check the _____ capacity

2) Observe zero references on the _____ and _____

8. Identify the major parts of a dial indicator.

a. _____

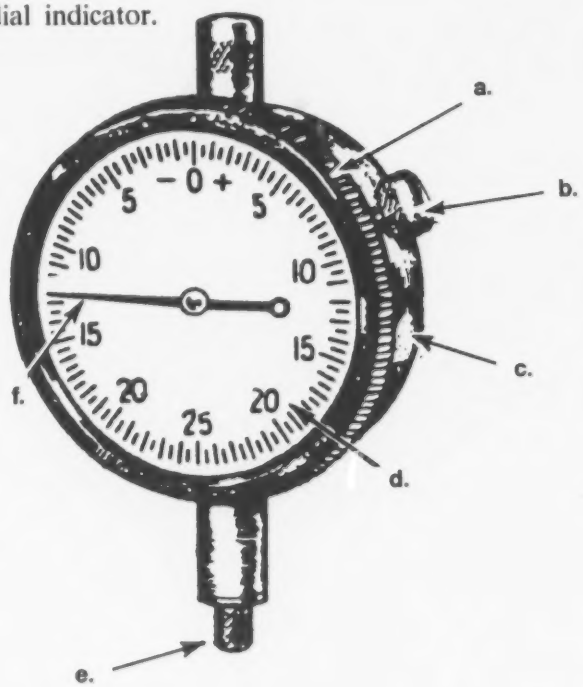
b. _____

c. _____

d. _____

e. _____

f. _____



9. Arrange in order the steps for set up and use of a dial indicator by placing the correct sequence numbers in the appropriate blanks.

_____a. Pre-load indicator

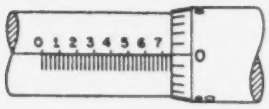
_____b. Measure work

_____c. Positions plunger in contact with surface to be measured

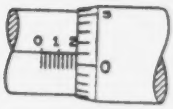
_____d. Secure dial indicator to suitable mounting fixture

_____e. Zero dial

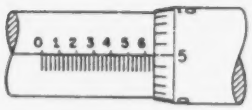
10. Read the following plain micrometer settings



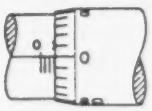
a. _____



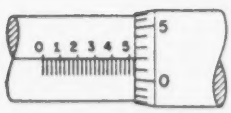
b. _____



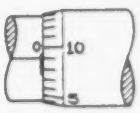
c. _____



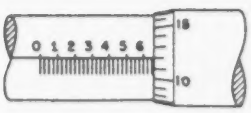
d. _____



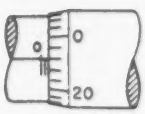
e. _____



f. _____



g. _____



h. _____

11. Read the following vernier micrometer settings

Answers

a._____

b._____

c._____

d._____

e._____

f._____

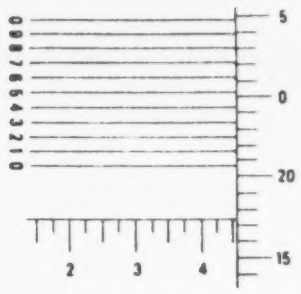
g._____

h._____

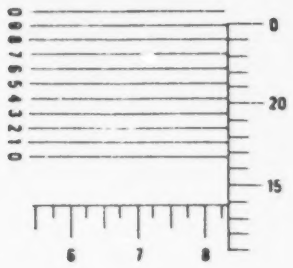
i._____

j._____

a.



b.



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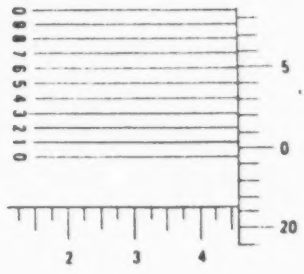

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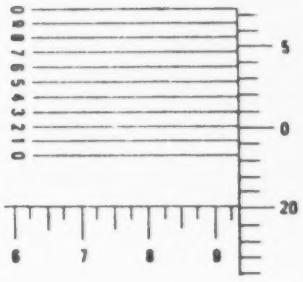

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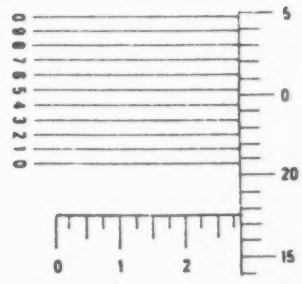

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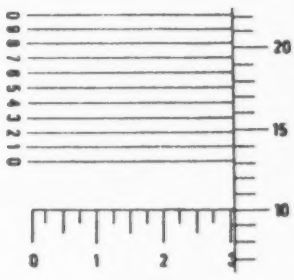

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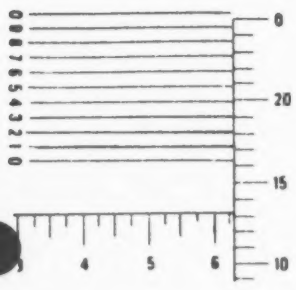

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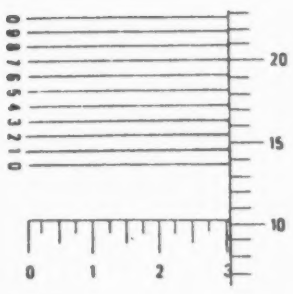

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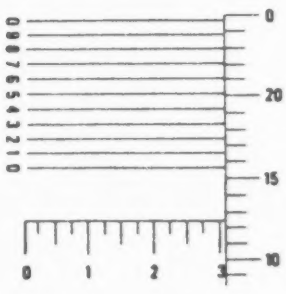

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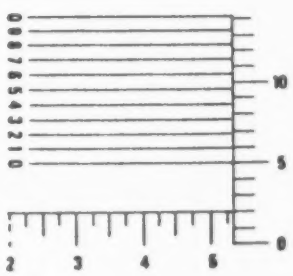


COMPETENCY TEST
SMALL ENGINE REPAIR

NAME _____ DATE _____

UNIT: Troubleshooting

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to define and discuss troubleshooting problems and how to repair them correctly.

DIRECTIONS: Read and answer the following questions in the space provided.

1. Define troubleshooting.

2. Explain the value of a troubleshooting chart.

3. Select the requirements needed for an engine to run. Check "√" the appropriate blank.

   a. _____ Ignition

   b. _____ Speed

   c. _____ Compression

   d. _____ Fuel

   e. _____ Centrifugal force

   f. _____ Pulley

4. Place a " √ " for true statements concerning the importance of understanding troubleshooting procedures.

   a. _____Saves the customer money

   b. _____Ensurers a better repair job as the total engine is observed

   c. _____Ensures better operating dependability

   d. _____Fewer employees are needed to operate a shop

   e. _____Good service means continued business with present customers plus attracting new customers.

   f. _____Makes employees more valuable because less work is returned.

Use a troubleshooting chart to solve these problems. (Use Unit 6 TM-2)

a. The equipment has been running for 45 minutes and the engine shuts down.

b. The engine starts to vibrate excessively.

c. Engine has just had a ignition tuneup and was in top starting and running order when given to the customer. Two days later the customer could not start the engine.

d. Engine is hard to start and has a kick back.

e. No fuel found in the carburetor.

f. Engine is beginning to loose power (Two Cycle).

g. Engine starts to smoke excessively and use oil.

h. Engine starts to overheat and begins to smoke.

COMPETENCY TEST

WELDING

NAME _____ **DATE** _____

UNIT: Introduction to Welding

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to identify welding equipment, safely set up, light, adjust, and properly operate oxyacetylene welding equipment.

DIRECTIONS: Read and answer the following questions in the space provided.

Fill in the blank with the word that will best complete the statement. Use words listed below.

acetylene	1900
non-pressure	higher
oxygen	medical
melting	explosive
efficiency	fusion
flame	

1. Oxyacetylene welding joins metals by _____ them together.
2. The process of oxyacetylene welding has been used since the year _____.
3. Oxyacetylene welding is one basic process of joining metal by _____ alone.
4. If pure oxygen is used, the burning temperature of the flame is much _____ than when air alone is used.
5. Oxygen is not only used for welding but also is used for _____ needs.
6. If free _____ is placed under a pressure greater than 15 pounds per square inch, it may explode.
7. _____ is always one of the elements needed to produce a flame.

8. Oil in regulators, hoses, or torches will burn with _____ speed when exposed to pure oxygen.

9. The torch flame must be of proper size, shape, and condition to operate with maximum _____.

10. The welder must produce the proper _____ each time the torch is lighted.

11. Point out the correct safety rules by writing **True** or **False** for each of the following statements.

_____ a. Cylinders should be fastened to a wall or dolly in an upright position so they cannot be knocked over.

_____ b. Acetylene cylinders should never be laid on their sides because the acetylene is in the liquid acetone and the acetone will be drawn out with the acetylene.

_____ c. Stop welding when the torch is burning with a yellow flame as the acetone is being burned.

_____ d. Do not oil the regulators or handle welding equipment with oily gloves.

_____ e. Open cylinder valves for several minutes to remove dust and dirt before attaching a regulator.

_____ f. Loosen the adjusting screw on regulator before opening the cylinder valve so no damage to the regulator or injury to the operator will occur.

_____ g. Stand directly in front of the regulator when opening the cylinder valve so that you can see the regulator better.

_____ h. Open valves very slowly on cylinders.

_____ i. Never use acetylene at pressures above 15 PSI because it is very **unstable**.

_____ j. Check for leaks in hoses and fittings every 15 minutes with soapy water.

_____ k. Drain the oxygen and acetylene lines at the same time because it is quicker.

_____ l. Have safety clothing and protection in place before lighting the torch.

_____ m. Always light the acetylene before opening the oxygen valve on the torch.

_____ n. Make sure that no one or any material that will burn is in the direction of the flame when lighting and using the torch.

_____ o. Oxygen is a cooling gas and can be used to cool oneself on a hot day.

_____ p. Know how to use fire extinguishers in the shop.

_____ q. Open the acetylene cylinder valve several turns so that the acetylene gas will flow freely.

_____ r. Avoid welding on materials that give off fumes that are poison or that may explode.

_____ s. Ventilation in welding areas is not necessary because smoke rises.

_____ t. Close the main cylinder when the oxyacetylene unit is not in use for long periods of time.

_____ u. Turn off the oxygen torch valve fast when shutting down the welding unit.

_____ v. Leave empty cylinders in the welding area because you should move cylinders as little as possible.

_____ w. Place steel caps on all cylinders when moving or storing them.

_____ x. Keep welding area neat and free from extra materials.

_____ y. Avoid handling hot metal with gloves.

_____ z. Use loose-fitting wrenches when installing or removing regulators so the wrenches may be removed quickly.

12. Write the number of each part of the oxyacetylene welding equipment by its correct name.

_____ a. Oxygen cylinder

_____ b. Acetylene cylinder

_____ c. Cylinder valves

_____ d. Winged adjusting nut

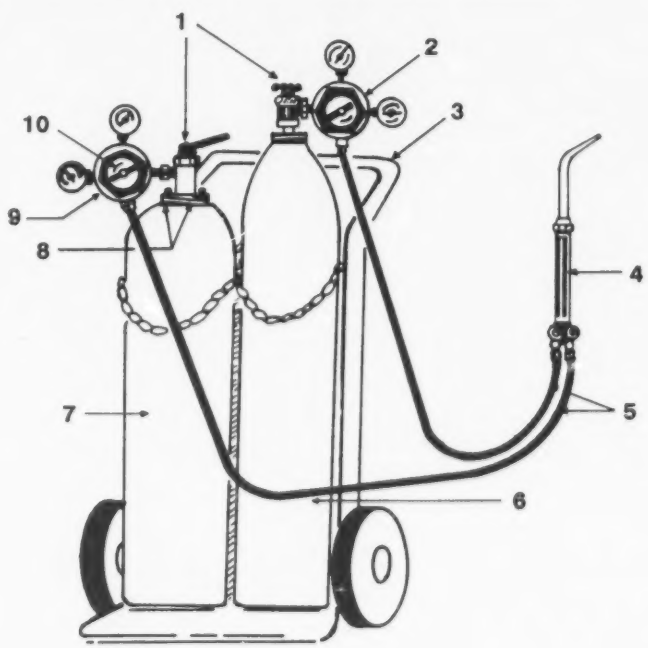
_____ e. Cart

_____ f. Oxygen regulator

_____ g. Acetylene regulator

_____ h. Torch body

_____ i. Hoses



13. Write the correct name of each of the oxyacetylene welding flames in the correct blank.

Neutral

Acetylene burning in air

Oxidizing

Carburizing

a. _____

b. _____

c. _____

d. _____

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14. Match the parts of a welding torch with their functions.

____a.	The basic body of the torch that contains valves to control the flow of oxygen and acetylene.	1. Welding head or tip
____b.	The welding torch component that contains mixer or injector, and the mixing throat.	2. Torch handle

15. The _____ oxyacetylene flame is the best for welding.

COMPETENCY TEST

WELDING

NAME _____ **DATE** _____

UNIT: Oxyacetylene Welding Positions and Applications

UNIT OBJECTIVE: After completing this unit the student(s) will be able to make and check the oxyacetylene welds for defects correctly.

DIRECTIONS: Read the following questions and answer them in the spaces provided.

1. Match the terms associated with oxyacetylene welding with their definitions by placing the number in front of each term below in the correct blank.

____a. A soft, chalky stone used for marking on steel.	1. Inner cone
____b. Joining two pieces of metal by heating the adjoining edges to the melting point, allowing them to flow together, and then cool.	2. Backfire
____c. The metal to be welded.	3. Root of weld
____d. The white part inside the neutral flame.	4. Base metal
____e. The circular movement of the torch causing uniform patterns on the metal.	5. Fusion weld
____f. A fire burning inside the torch, causing a squealing or hissing sound.	6. Flashback
____g. A sudden burning-back of the flame into the tip and the flame goes out with a loud "pop."	7. Weave
	8. Puddling

____h. The part of a weld farthest from the application of the weld heat and/or filler metal side.

____i. The depth the heat of the torch melts the metal during welding.

____j. Heating the base metal to its melting point and moving the pool of molten metal steadily along the length of the base metal.

9. Penetration

10. Soapstone

2. Circle the letter in front of each of the 5 factors which affect the quality of an oxyacetylene weld.

   a. Proper torch adjustment

   b. Brand of torch used

   c. Angle of tip

   d. Length of weld metal

   e. Distance of tip from base metal

   f. Movement of tip

   g. Rate of travel

3. Place a "√" in front of each of the factors that should be considered when selecting a tip size for welding.

   _____ a. Thickness of metal

   _____ b. Position of weld

   _____ c. Size of welding rod

   _____ d. Time of day

4. Place a "√" in front of the two factors that should be considered when selecting a filler rod.

   _____ a. Size of welding torch

   _____ b. Rod with similar properties of base metal

_____ c. Size of weld fillet

_____ d. Room temperature

5. Write **Yes** or **No** in the spaces at the left to identify the properties of a good weld.

_____ a. Weld metal is fused into base metal

_____ b. Plenty of weld splatter

_____ c. Top of weld sinks in

_____ d. The width is the same for the entire length of the bead

_____ e. The bead is straight or follows the proper path

6. Determine which welds do not require filler rod. (circle answer)

a. Outside corner weld, or inside corner weld

b. Flange weld, or V-butt weld

7. List the four positions used in welding.

a.

b.

c.

d.

8. Use "**D**" for disadvantage, and "**A**" for advantage for each of the following statements about brazing.

_____ a. Brazing uses lower temperature in the welding process.

_____ b. Brazing materials are expensive.

_____ c. Brazing does not melt base material.

_____ d. Brazing can join unlike metals.

_____ e. Brazing can be done on light metals.

_____ f. Brazing will bond cast iron.

9. List three steps in preparing metal for brazing.

   a.

   b.

   c.

10. Point out the uses of flux. Circle the letter in front of each correct use.

   a. Helps clean the base metal.

   b. Cleans the air of fumes.

   c. Eases flow of brass filler rod.

   d. Allows brass filler rod to enter base metal pores.

   e. Prevents oxidation of filler rod and base metal.

   f. Allows base metal to melt more quickly.

COMPETENCY TEST

WELDING

NAME _____ DATE _____

UNIT: Using the Cutting Torch

UNIT OBJECTIVE: After completing this unit the student(s) will be able to identify parts of the cutting torch and problems resulting from improper use or adjustment of the cutting torch.

DIRECTIONS: Read and answer the following questions in the spaces provided.

1. Match the following terms and definitions:

_____a. Oxidizing	1. A sudden burning of the flame back into the torch as the flame goes out with a pop
_____b. Tip cleaner	2. The process by which steel is removed by heating to the melting point and then rapidly oxidizing it with pure oxygen under pressure
_____c. Preheat time	3. Combining of oxygen with steel forming a scale or slag
_____d. Oxides	4. The deposits or oxides left after a cut has been made
_____e. Drag lines	5. Rust, corrosion, scale coating, or slag
_____f. Backfire	6. The slot where metal was removed in the form of oxides during the cutting process
_____g. Preheat orifice	7. The lines formed on the metal being cut which appear to be lagging behind at the bottom of the cut
_____h. Flame cutting	8. A fire burning inside the torch
_____i. Slag	9. Heating the metal at the starting point of a cut to its melting temperature

_____j. Kerf

_____k. Flashback

10. The part of the cutting tip which mixes the gases to produce a preheat flame

11. A tool with different sized wires to remove carbon deposits from welding tips

2. Identify the parts of the torch body and cutting attachment by placing the correct number to the left of the letter.

_____ a. Torch body

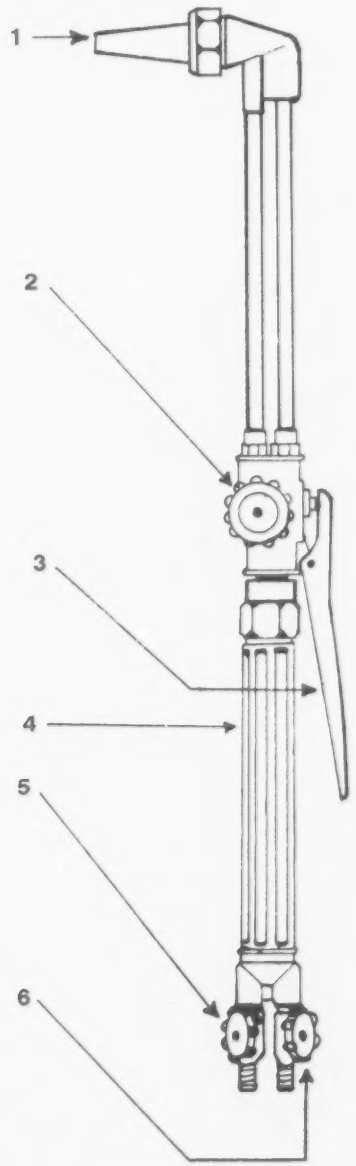
_____ b. Cutting tip

_____ c. Acetylene torch valve

_____ d. Cutting lever

_____ e. Oxygen torch valve

_____ f. Oxygen preheat valve



3. Point out the hazards of hot slag by answering **Yes** or **No** to each of the following statements

   _____ a. Hot slag gives off radiation.

   _____ b. Hot slag will cause burns to the body.

   _____ c. Hot slag takes days to cool.

   _____ d. Slag will burn hoses.

   _____ e. Hot slag will cause concrete to explode.

   _____ f. Hot slag causes fire on clothing.

4. Place a " √ " in front of any of the following phrases that best identify the causes of backfires.

   _____ a. Moisture in the air

   _____ b. Acetylene or oxygen pressure too low

   _____ c. Cutting tip nut loose

   _____ d. Overheating the cutting tip

   _____ e. Improper weave pattern

   _____ f. Faulty O-rings

   _____ g. Rust or dirt on metal being welded

5. Determine the results of a backfire by circling the correct answer in each of the following:

   a. The flame burns inside the tip (for hours, for a short time).

   b. There is usually a loud (pop, explosion).

   c. The flame sometimes (gets bigger, goes out).

   d. The flame may continue to burn (normally, out of control).

6. Point out the results of a flashback by circling the correct answer in each of the following:

   a. A fire is burning (around the tip, inside the torch).

   b. The flame seems (to go out, to get larger).

   c. A squealing or hissing noise means the flashback is (over, beginning).

d. Torch starts (smoking, shaking) and getting (hot, cold).

e. The torch will (quit burning, burn in half) if a flashback continues.

7. Determine the reasons for poor torch cuts by placing the letter of the reason next to the correct torch cut illustration.

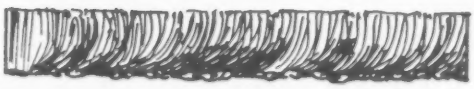
_____ a.

_____ b.

_____ c.

_____ d.

_____ e.

_____ f. 

_____ g.

_____ h.

1. Oxygen pressure too high
2. Unsteady torch movement
3. Cutting speed fast
4. Cutting speed slow
5. Cut stopped and started poorly
6. Oxygen pressure too low
7. Preheat flames too long
8. Preheat flames too small

8. Match the terms on the right with their correct definitions.

_____a. A condition where the most distant portion of the cutting stream lags behind the stream nearest the cutting tip	1. Kerf
_____b. The cut made by a cutting torch	2. Slag
_____c. The porous oxidized residue left after oxyacetylene cutting	3. Drag line

9. Complete a list of characteristics of a good cut by inserting the word(s) that best completes each statement.

   a. Edge is _____.

   b. Drag lines are _____ and _____.

   c. No adhering _____ at bottom edge of cut.

10. Select the true statements concerning the characteristics of oxyacetylene cutting by placing a "T" in the appropriate blanks.

   _____ a. Oxyacetylene cutting units are readily portable and can be taken to the work as opposed to having to bring the work to the cutting equipment.

   _____ b. Oxyacetylene cutting equipment is relatively inexpensive when compared to the cost of other cutting procedures.

   _____ c. Oxyacetylene cutting can be accomplished quickly, but is probably the slowest method of cutting thicker metals or cutting irregular or odd shapes.

   _____ d. Oxyacetylene cutting, when properly executed, delivers a high-quality cut.

   _____ e. Oxyacetylene cutting is often done manually, but can be adapted to automatic processes.

COMPETENCY TEST

WELDING

NAME _____ DATE _____

UNIT: Introduction to Shielded Metal Arc Welding

UNIT OBJECTIVE: After completing this unit the student(s) will be able to identify welds, welding equipment, types of welds, types of joints, different electrodes and the welding positions used in arc welding and proper safety.

DIRECTIONS: Read and answer the following questions in the spaces provided.

1. Explain the arc welding process by writing the number of the word(s) that best complete(s) each statement in the blank provided.

   a. The work to be welded is connected to one side of an electric circuit and the _____ to the other side.

      1. ground clamp
      2. electrode
      3. welding lead
      4. welding torch

   b. To produce an arc for welding, the two parts of the electrical circuit are brought together and then _____.

      1. jerked apart
      2. allowed to stick
      3. separated slightly

   c. The electric current jumps the gap from the electrode to the base metal, causing a continuous spark referred to as _____.

      1. an arc
      2. bright lights
      3. party lights
      4. northern lights

d. The high temperature of the arc causes the metal to melt, forming a _____.

1. mess
2. spatter
3. puddle
4. hole

e. When the welding process is stopped, the melted metal _____.

1. becomes solid
2. becomes rusted
3. disappears because the light has gone out

2. Point out the hazards of arc welding by placing a " √ " in front of each.

_____ a. The high temperature of the arc

_____ b. Severe burns caused by hot metal

_____ c. Harmful rays given off by the welding arc

_____ d. The travel to and from your home

3. Match the following terms associated with arc welding to the definition by writing the number of each term in the correct blank on the left.

_____a. A welding process that joins metals by heating them with an electric arc jumping from a coated electrode to the metal

_____b. The flow of electric current from the tip of the electrode to the metal being welded

_____c. A bare or flux-coated electrode that is melted into the metal being welded, using heat from an electric arc

_____d. A chemical coating on the electrode that allows the molten metal to fuse to the metal being welded, and keeps out impurities

_____e. The metal being welded

_____f. Metal added to the weld to produce buildup

_____g. The buildup of metal from the electrode on the weld

_____h. The recessed area at the end of a weld

_____i. Distance from the end of the electrode to the base metal being welded

_____j. A unit for welding in which current changes direction 120 times per second

_____k. A unit for welding in which the current travels in one direction only

_____l. The measurement for electric current

_____m. American Welding Society

1. AC (Alternating current) welder
2. DC (Direct current) welder
3. Crater
4. Base metal
5. AWS
6. Shielded metal arc welding
7. Flux
8. Electrode
9. Amperage
10. Arc
11. Deposited metal
12. Filler metal
13. Arc length

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4. Identify three types of arc welders by filling in the correct term in each blank from the list below.

_____ a. A transformer-type of welder producing alternating current

_____ b. A motor or engine-driven generator producing direct current

_____ c. A transformer rectifier producing either type of current

Carbon-arc welder

AC welder

Oxyacetylene welder

AC-DC welder

DC welder

5. Explain how each of the welding machine adjustments affects the welding process by writing the number of the correct result in the blank on the left.

_____a. Increased amperage

_____b. Decreased amperage

_____c. Reversed polarity

_____d. Straight polarity

1. Allows current to flow from electrode to base metal
2. Produces more heat
3. Allows current to flow from base metal to electrode
4. Produces less heat

6. Select special uses of the arc welder by writing **Yes** in front of each of the proper uses.

_____ a. Cutting can be done with a special electrode

_____ b. Brazing of cast iron

_____ c. Hole piercing

_____ d. Gouging or removing metal

_____ e. Soldering

_____ f. Beveling metal edges

7. Identify each of the parts of arc welding equipment by placing the number of each part in the blank to the left of the correct name.

_____ a. Arc welder

_____ b. Welding helmet

_____ c. Leather gloves

_____ d. Electrode holder

_____ e. Welding leads

_____ f. Chipping hammer

_____ g. Wire brush

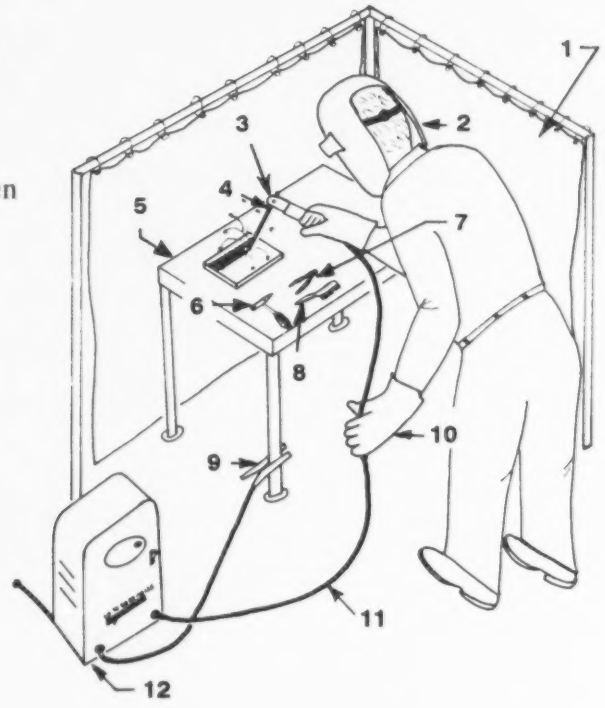
_____ h. Metal table

_____ i. Electrode

_____ j. Ground clamp

_____ k. Pliers

_____ l. Protective screen



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8. Point out the parts of a welding lens assembly by writing each of the following terms in the correct blanks.

Hold-down clamp

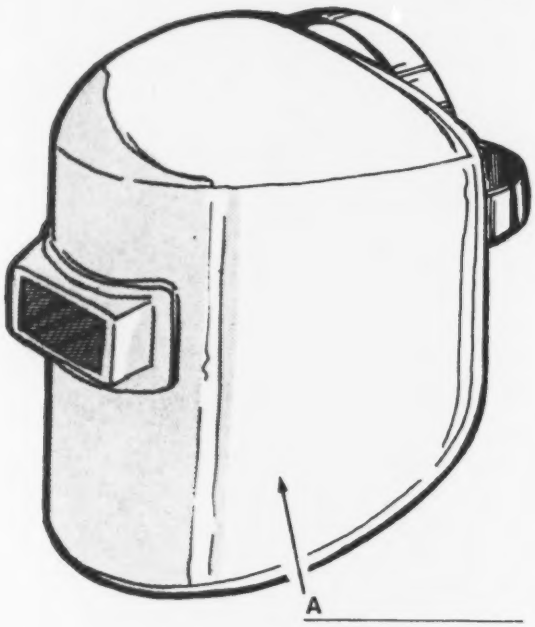
Helmet

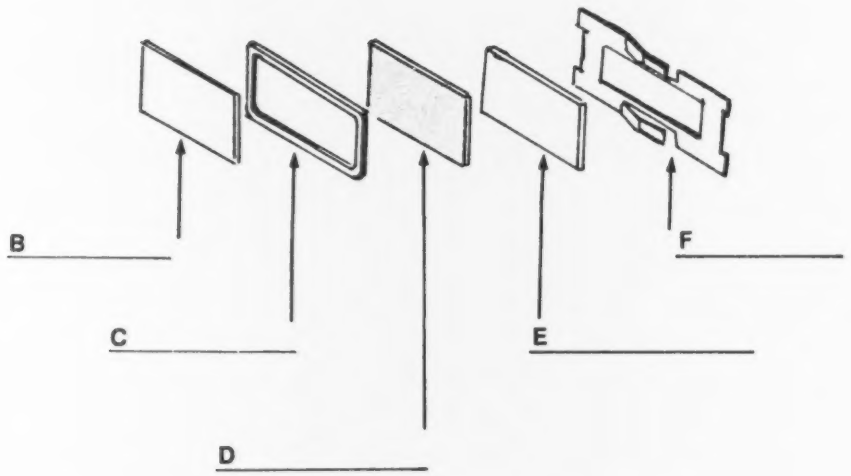
Filter lens

Clear plastic lens

Rubber gasket

Clear plastic lens





Select the proper safety procedures associated with the hazards of arc welding by answering **True** or **False** to each of the statements below.

9. Electrical shock

_____ a. The welder does not need to be grounded to be safe.

_____ b. The welder should be kept in a cool damp area.

_____ c. The welding cables are armored, so it does not hurt to run over them with the welding dolly.

_____ d. When welding, do not stand on wet surfaces or in water.

_____ e. Use electrode holders as long as possible, even when cracked, because they are expensive.

_____ f. Wear leather gloves that are in good condition.

10. Radiation

_____ a. The face and eyes should be covered with an arc welding helmet or shield.

_____ b. Ultraviolet and infrared rays will only burn the skin of certain people.

_____ c. A verbal warning should be given to **all persons** in the area before striking an arc.

_____ d. Cracks in a helmet will not be any problem if the lens is good.

_____ e. Replace any cracked helmet lens.

_____ f. Oxyacetylene goggles may be worn when arc welding.

11. Sparks and slag

_____ a. Wear high-topped leather shoes.

_____ b. Low-topped shoes may be worn if pants with cuffs are worn.

_____ c. Shirts should have long sleeves and button-up collars.

_____ d. Wear welding gloves of leather.

_____ e. Leather welding sleeves should be worn when available.

_____ f. Leather aprons should be worn when available.

_____ g. Safety glasses are not necessary if you shield your eyes with your hand when chipping or cleaning welds.

12. Fumes and gases

_____ a. There is no danger when welding galvanized metal.

_____ b. Fans or adequate ventilation should be provided to remove toxic gases.

_____ c. Avoid welding on containers or metals that have contained chemicals or been painted.

_____ d. Sparks will not ignite oily rags.

_____ e. Do not weld on containers that have held a combustible substance.

_____ f. Keep a butane lighter in your pocket for use with the cutting torch.

13. Hot metals

_____ a. Handle hot metal with leather gloves.

_____ b. Stand to one side when dropping hot metal into a cooling vat because hot steam will be given off.

_____ c. Molten metal splatter usually cools quickly and will not burn the skin.

14. Point out the types of welding electrodes by placing a " √ " in front of each of the following electrode types.

_____ a. Mild steel

_____ b. Low hydrogen

_____ c. High hydrogen

_____ d. Stainless steel

_____ e. Brass

_____ f. Cast iron

_____ g. Hard surfacing

_____ h. Copper

_____ i. Non-ferrous

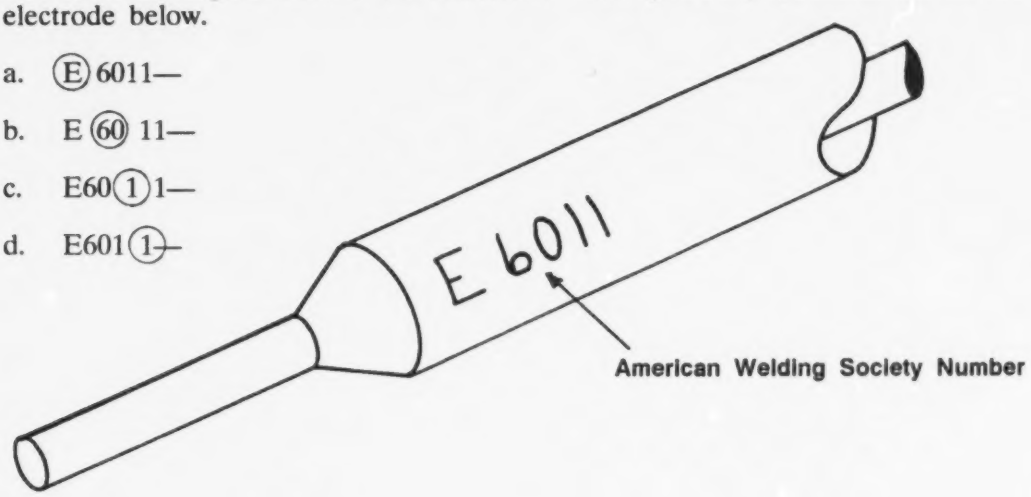
15. Give the meaning for each of the American Welding Society specifications on the electrode below.

a. (E) 6011—

b. E (60) 11—

c. E60 (1) 1—

d. E601 (1)—



16. Point out the two factors to remember when determining electrode sizes by writing the number of the correct answer in the blank provided.

a. The size is determined by the diameter of _____.

1. the flux coating of the electrode
2. the metal rod in the electrode

b. The sizes of electrodes range in size from _____.

1. 1/32 to 5/16-in.
2. 1/8 to 1/4-in.

17. Determine the purpose of flux by placing a " " in front of each correct statement below.

_____ a. Mixes air with the molten metal.

_____ b. Allows the weld to cool more slowly, making the weld stronger.

_____ c. Removes impurities from the weld puddle.

_____ d. Prevents the arc from moving around on the metal.

_____ e. Prevents holes from forming in the weld metal.

_____ f. Adds alloys to the weld metal for strength.

_____ g. Allows a faster deposit rate.

18. Point out the things needed to make a good weld by placing a " √ " in front of each below.

_____ a. Correct electrode size

_____ b. Correct current

_____ c. Correct electrode length

_____ d. Correct arc length

_____ e. Correct travel speed

_____ f. Correct electrode angle.

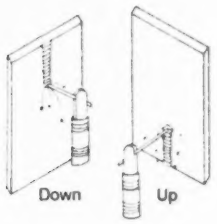
19. Identify each of the following welding positions by labeling each illustration with one of the following terms:

Horizontal

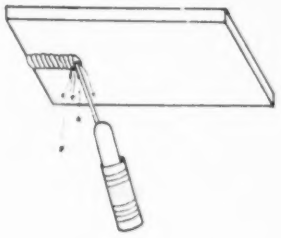
Overhead

Vertical

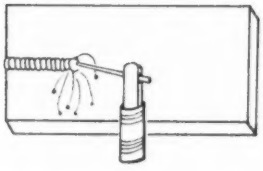
Flat



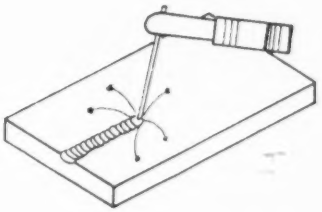
a. _____



b. _____



c. _____



d. _____

20. Identify each of the weld joints by labeling each illustration with one of the following terms:

Edge joint

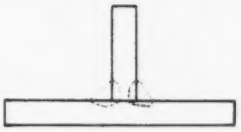
Butt joint

Tee joint

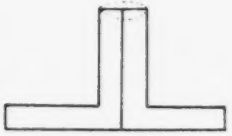
Lap joint

a. _____

b. _____



c. _____



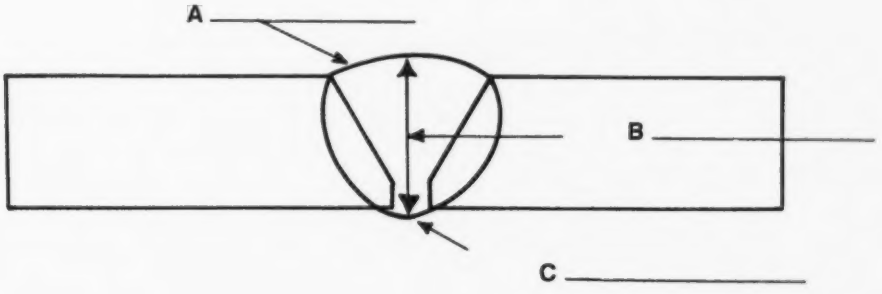
d. _____

21. Identify each of the parts of a fillet weld by labeling each with one of the following terms:

Throat

Root

Face



22. Identify each of the terms associated with the welding process by placing each number to the left of the correct term.

_____ a. Weld

_____ b. Slag

_____ c. Base metal

_____ d. Angle of electrode

_____ e. Arc length

_____ f. Electrode

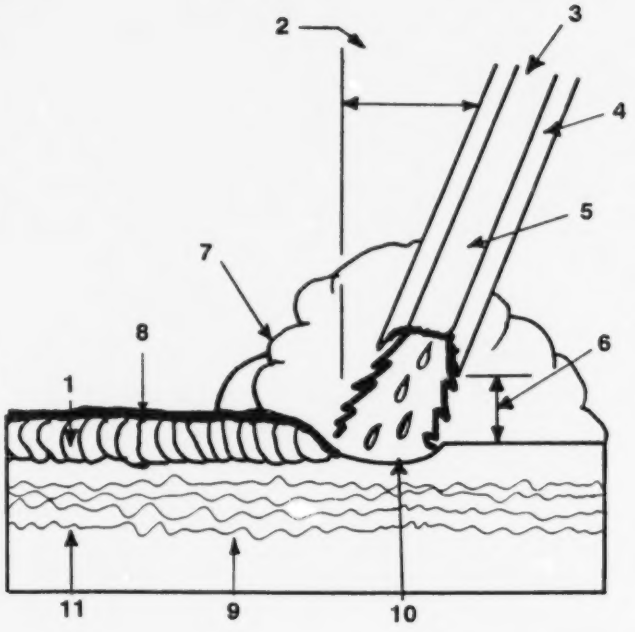
_____ g. Flux coating

_____ h. Wire core

_____ i. Crater

_____ j. Penetration

_____ k. Gaseous shield



COMPETENCY TEST

WELDING

NAME _____ DATE _____

UNIT: Welding Joints and Positions

UNIT OBJECTIVE: After completing this unit, the student(s) will be able to use the correct welding terminology in pointing out the factors involved in producing a quality arc weld.

DIRECTIONS: Read and answer the following questions in the space provided.

1. Match the terms associated with arc welding to the correct definition by placing the correct number to the left of the letter.

_____a. Joining two pieces of metal by heating the adjoining edges to the melting point, allowing them to flow together, and then cooling	1. Tack weld
_____b. The depth the heat of the arc melts the metal during welding	2. Horizontal position weld
_____c. The exposed surface of a fusion weld	3. Porousness
_____d. The bottom or the part of a weld farthest from the application of weld heat	4. Vertical position weld
_____e. A weld laid on a horizontal seam on a piece of metal	5. Fusion
_____f. A weld laid on a vertical seam on a piece of metal	6. Puddle
_____g. Metal plates which have beads running side by side and slightly overlapping so that the beads form a solid mass	7. Rate of travel
	8. Weave

_____h. Weld metal that has gas pockets in the weld area

_____i. The part of the weld crater left unfilled because of incorrect electrode movement or too much amperage

_____j. A small hole in the weld metal caused by trapped gases

_____k. A non-metallic porous material trapped in weld metal

_____l. A short weld made to hold parts in place until the final weld can be made

_____m. The area on a weld where the metal is molten from the heat of the arc

_____n. The movement of the electrode during welding to provide the proper width and buildup

_____o. A term applied to a rapid movement of the electrode to prevent overheating the weld area and allow the molten metal to solidify

_____p. The speed the electrode is moved across the weld area

9. Penetration

10. Pinhole

11. Pads

12. Face of weld

13. Undercut

14. Root of weld

15. Whipping

16. Slag deposits

2. Point out the factors to consider when setting welder amperage by placing a " √ " in front of each of the following phrases that must be considered.

_____ a. Length and size of welding cables

_____ b. Length of electrode

_____ c. Thickness of base metal

_____ d. Welding technique

_____ e. Diameter of electrode

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_____ f. Type of welding gloves

_____ g. Type of welder

_____ h. Polarity of a DC welder

_____ i. Type of welding joint or position

3. Select the factors one must consider when selecting electrodes by answering Yes or No to each of the following phrases:

_____ a. Welding position

_____ b. Type of ventilation system in the shop

_____ c. Strength of weld desired

_____ d. Type of base metal

_____ e. Welding current (AC or DC)

_____ f. Thickness of base metal at weld area

_____ g. Design of weld joint

_____ h. Amount of moisture in the air

4. Determine the factors that affect the quality of a weld by underlining the following phrases that affect a weld's quality.

a. Amperage

b. Arc length

c. Rate of travel

d. Thickness of metal

e. Angle of electrode

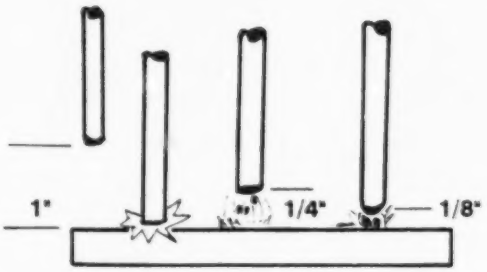
5. Select the methods of striking an arc by placing the correct word from the list by the illustration representing each.

Dragging

Tapping

Scratching

Slapping

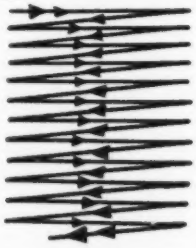


_____a.

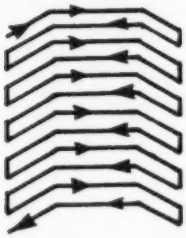
_____b.

6. Identify the proper weave patterns by placing a " √ " in front of each of the usable patterns.

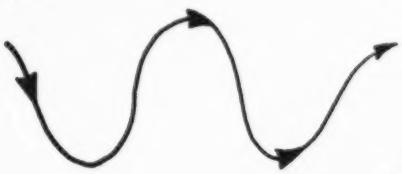
_____ a.



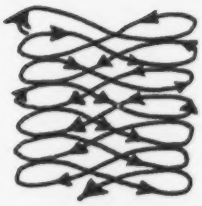
_____ b.



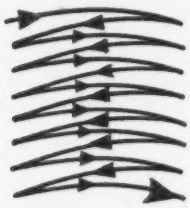
_____ c.



_____ d.



_____ e.



7. List three reasons for fusing one bead to another in a weld.

   a.

   b.

   c.

8. Pick out the correct reasons to remove slag by placing a check " √ " in front of each.

   _____ a. Allows better fusion of other beads

   _____ b. Gives welder time to rest between welds

   _____ c. Prevents slag deposits from forming in a bead

   _____ d. Improves appearance of a weld

COMPETENCY TEST

WELDING

NAME _____ DATE _____

UNIT: MIG Welding

UNIT OBJECTIVE: After completing this unit the student(s) will be able to make metallic inert-gas (MIG) welded joints.

DIRECTIONS: Read and answer the following questions in the space provided.

1. Match the following terms and definitions

1. Shielding gases	_____a. Gases used to displace the air around the arc to prevent oxidation and contamination
2. Whiskers	_____b. A welding process using a consumable electrode which is fed to the weld joint and shielded with gas
3. Stick-out	_____c. An abbreviation used to describe gas metal arc welding
4. Welding current	_____d. A gas metal arc welding process using low voltage, low current, and small wire diameter
5. Short arc	_____e. Usually direct current reverse polarity with the electrode (wire) positive and the work negative
6. MIG welding	_____f. The distance the wire sticks out past the contact tip of the gun
7. GMA welding	_____g. Short welding wire that feeds through the weld and extends past the root of the weld

2. Point out the advantages of MIG welding by placing a " √ " in the space provided at the left.

_____ a. Small amount of spatter and no slag

_____ b. Low welding rate

_____ c. Different metal thicknesses may be welded without changing wire size

_____ d. Gaps and badly fitting joints may be filled easily without burning through

_____ e. Metal distortion is reduced

_____ f. Welding is possible in one position only

3. Point out the types of MIG welding processes by placing a " √ " in the space provided at the left.

_____ a. Short arc—uses low current (amperage), low voltage, and small wire size

_____ b. Spray arc—employs high current (amperage), high voltage, and large wire size

_____ c. Flux-cored wire—can be used to weld steel without a shielding gas

4. Point out the factors to consider when selecting filler wire by placing a " √ " in the space provided at the left.

_____ a. Alloy of metal to be welded

_____ b. Amount of rust on the metal

_____ c. Metal thickness

_____ d. Design of weld joint

_____ e. Job specifications

5. Identify the types of welding filler wire by placing a " √ " in the space provided at the left.

_____ a. Solid

_____ b. Flux-cored

_____ c. Flux coated

6. Identify the types of shielding gases by placing a " √ " in the space provided at the left.

_____ a. Argon

_____ b. Oxygen

_____ c. Acetylene

_____ d. Helium

_____ e. Carbon dioxide

7. Point out the factors to consider when adjusting shielding gas flow rate by placing a " √ " in the space provided at the left.

_____ a. The amount of shielding gas supplied at the weld is controlled by a gas flow meter.

_____ b. Too much shielding gas will change the color of the metal being welded.

_____ c. The flow rate is measured in cubic feet per hour.

_____ d. The flow meter is adjusted to provide the proper amount of shielding gas for the thickness of metal being welded.

_____ e. Too little shielding gas will cause the weld to be of high quality.

8. The amount of shielding gas supplied at the weld is controlled by a gas _____ _____.

9. The flow rate on a flow meter is measured in _____ feet per hour.

10. The two types of welding filler wire are _____ and _____.

COMPLIANCE STATEMENT

TITLE VI, CIVIL RIGHTS ACT OF 1964; THE MODIFIED COURT ORDER, CIVIL ACTION 5281, FEDERAL DISTRICT COURT, EASTERN DISTRICT OF TEXAS, TYLER DIVISION

Reviews of local education agencies pertaining to compliance with Title VI Civil Rights Act of 1964 and with specific requirements of the Modified Court Order, Civil Action No. 5281, Federal District Court, Eastern District of Texas, Tyler Division are conducted periodically by staff representatives of the Texas Education Agency. These reviews cover at least the following policies and practices:

(1) acceptance policies on student transfers from other school districts;

(2) operation of school bus routes or runs on a non-segregated basis;

(3) nondiscrimination in extracurricular activities and the use of school facilities;

(4) nondiscriminatory practices in the hiring, assigning, promoting, paying, demoting, reassigning, or dismissing of faculty and staff members who work with children;

(5) enrollment and assignment of students without discrimination on the basis of race, color, or national origin;

(6) nondiscriminatory practices relating to the use of a student's first language; and

(7) evidence of published procedures for hearing complaints and grievances.

In addition to conducting reviews, the Texas Education Agency staff representatives check complaints of discrimination made by a citizen or citizens residing in a school district where it is alleged discriminatory practices have occurred or are occurring.

Where a violation of Title VI of the Civil Rights Act is found, the findings are reported to the Officer for Civil Rights, Department of Health, Education and Welfare.

If there is a direct violation of the Court Order in Civil Action No. 5281 that cannot be cleared through negotiations, the sanctions required by the Court Order are applied.

TITLE VII, CIVIL RIGHTS ACT OF 1964; EXECUTIVE ORDERS 11246 AND 11375; TITLE IX, 1973 EDUCATION AMENDMENTS; REHABILITATION ACT OF 1973 AS AMENDED; 1974 AMENDMENTS TO THE WAGE-HOUR LAW EXPANDING THE AGE DISCRIMINATION IN EMPLOYMENT ACT OF 1967; AND VIETNAM ERA VETERANS READJUSTMENT ASSISTANCE ACT OF 1972 AS AMENDED IN 1974.

It is the policy of the Texas Education Agency to comply fully with the nondiscrimination provisions of all federal and state laws and regulations by assuring that no person shall be excluded from consideration for recruitment, selection, appointment, training, promotion, retention, or any other personnel action, or be denied any benefits or participation in any programs or activities which it operates on the grounds of race, religion, color, national origin, sex, handicap, age, or veteran status (except where age, sex, or handicap constitute a bona fide occupational qualification necessary to proper and efficient administration). The Texas Education Agency makes positive efforts to employ and advance in employment all protected groups.

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